CORRES. CONTROL
OUTGOING LTR. NO.

OE ORDER #

97-RF-04294

DIST.	LTR	ENC
ENSUSSEN, STAN		
RAILSFORD, MARV		
UHL, TONY		
URDGE, LARRY		
ARDING, WYNN		
ARD, BOB		
ILL, JOHN		
IARTINEZ, LEN		
GG, BOB		
ARKER, ALAN		
ILLER, ROBERT		
UOR, NANCY		
OORHEIS, GARY		
edahl, T. G.		
nderson, Scott		
oyd, Russ		
rowe, Steve		
etamore, Drew		
orr, Kent		
ahn, Steve		
ickle, Gordon		
ennedy, Colburn		
ihoud, Russ		
eters, Mike		
eben, Ann	X	
nland, Jennifer		
ORRES.CONTROL	X	X
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CLASSIFICATION:

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REPLY TO RFP CC NO.:

CTION ITEM STATUS:
PARTIAL/OPEN
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LTR APPROVALS:

IG. & TYPIST INITIALS:
AKS :bag

46469 (Rev. 3/97)

KAISER•HILL
COMPANY

August 6, 1997

97-RF-04294

Norma Castaneda
ES&H Program Assessment
DOE, RFFO

TRANSMITTAL OF THE DRAFT FIELD IMPLEMENTATION PLAN FOR THE SOURCE REMOVAL AT TRENCH 1, IHSS 108, REV. 0 - AKS-036-97

Please find enclosed the Draft Field Implementation Plan (FIP) for the Source Removal at Trench 1, IHSS 108. Comments to the FIP are requested by August 15, 1997.

Three copies of the Draft FIP have been hand delivered for distribution and review by August 15. Please note that to expedite the planning process, DOE's review is concurrent with Kaiser-Hill's.

If you have any questions regarding this transmittal, please contact me at (303) 966-9886.

A. K. Sieben
Waste & Remediation Operations

bag

Orig. and 1 cc - N. Castaneda

Enclosure:
As Stated

Kaiser-Hill Company, L.L.C.
Courier Address: Rocky Flats Environmental Technology Site, State Hwy. 93 and Cactus, Rocky Flats, CO 80007 • 303.966.7000
Mailing Address: P.O. Box 464, Golden, Colorado 80402-0464

ER/WM&I DDT

Source/Driver: (Name & Number from ISP, IAG milestone, Mgmt. Action, Corres. Control, etc.)	Closure #: (Outgoing Correspondence Control #, if applicable)	8/15/97 Due Date

S. J. Myrick for M. C. Burmeister — Originator Name

G. D. DiGregorio — QA Approval

A. M. Tyson — Contractor Manager(s)

Ann K. Sieben — Kaiser-Hill Program Manager(s)

T. G. Hedahl — Kaiser-Hill Director

Document Subject:

TRANSMITTAL OF THE DRAFT FIELD IMPLEMENTATION PLAN FOR THE SOURCE REMOVAL AT TRENCH 1, IHSS 108, REV. 0 - AMT-086-97

KH-00003NS1A August 6, 1997

Discussion and/or Comments:

Please find enclosed ***the Draft Field Implementation Plan (FIP) for the Source Removal at Trench 1, IHSS 108*** for your review and submittal to the Department of Energy (DOE) for concurrent review. Comments on the FIP are requested by August 15, 1997 on the attached review comment form. Please find enclosed two copies for Kaiwer-Hill and three copies for the DOE. If you have any questions regarding this document, please contact Tracey Spence at extension 4322.

Attachments:
As Stated

cc:
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A. C. Crawford, 116
Susan Myrick, T893B
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Ken Gillespie, H&S, T893B
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Al Helmick, RTG, T891E
Keith Karel, Wackenhut, 111
John Kirar, Tenera, 130
Ken Lenarcic, Dyncorp, 111
Tom Lindsay, RMRS, T893B
John Miller, SSOC, T690B
Karan North, Kaiser-Hill, T130C
Tim Parker, Dyncorp, 331
Carol Patnoe, Kaiser-Hill, T130C
Ian Patton, RMRS, T893A
John Schmuck, RMRS, T893B

DRAFT RF/RMRS-XX-XXXX

FINAL FIELD IMPLEMENTATION PLAN FOR THE SOURCE REMOVAL AT TRENCH 1 IHSS 108

Rocky Mountain Remediation Services, L.L.C.

August 1997
Revision 0

ADMINISTRATIVE INFORMATION

Site: Rocky Flats Environmental Technology Site (RFETS), Golden, Colorado

Project Name: Source Removal at Trench 1 - IHSS 108

Date Prepared: August 1997

Approvals

I have read and approved this Field Implementation Plan with respect to project procedures and the planned implementation of the Trench 1 Source Removal.

Mark Burmeister RMRS - Project Manager	Date
Ruth McCafferty RMRS - Health and Safety Supervisor	Date
Jerry Anderson RMRS - Radiological Coordinator	Date
Greg DiGregorio RMRS - Quality Assurance	Date
Scott Newsom SSOC - Radiological Engineering	Date
Paul Hapke SSOC - RMRS Radiological Safety Section Manager	Date

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ACRONYMS

ALARA.....As Low As Reasonably Achievable
CRZ.....Contamination Reduction Zone
CSS.....Consolidated Soil Stockpile
CWTF .....Consolidated Water Treatment Facility
cf..... .Cubic Foot
cy..... .Cubic Yard
DOE/RFFO.....Department of Energy/Rocky Flats Field Office
DynCorp .....DynCorp of Colorado, Inc.
EMD .....Environmental Management Department
eV .....Electron Volt
EZ.....Exclusion Zone
FID .....Flame Ionization Detector
FIDLER .....Field Instrument for the Detection of Low Energy Radiation
FIP .....Field Implementation Plan
FO.....Field Operations Standard Operating Procedure
HASP.....Health and Safety Plan
HEAF.....High Efficiency Air Filter
HEPA.....High Efficiency Particulate Air
HSS.....Health and Safety Specialist
IHSS .....Individual Hazardous Substance Site
IWCP.....Integrated Work Control Package
K-H.....Kaiser-Hill
NRWOL .....Non-Routine Waste Origination Log
OPs .....Operating Procedures
OSHA.....Occupation Safety and Health Administration
PAM .....Proposed Action Memorandum
PID .....Photoionization Detector
PPE .....Personal Protective Equipment
psi.....Pounds Per Square Inch
PSZ .....Project Support Zone
QA.....Quality Assurance
QC.....Quality Control
RBA.....Radiological Buffer Area
RCT.....Radiological Control Technician
RFETS .....Rocky Flats Environmental Technology Site
RTG.....Resource Technologies Group, Inc.
RMRS .....Rocky Mountain Remediation Services, L.L.C.

RWP .....Radiological Work Permit
SAP.....Sampling Analysis Plan
SCA.....Soil Contamination Area
SCBA.....Self Contained Breathing Apparatus
SEG.....Scientific Ecology Group
SSOC.....Safe Sites of Colorado, Inc.
TDU.....Thermal Desorption Unit
VOCs .....Volatile Organic Compounds

LIST OF STANDARD OPERATING PROCEDURES (SOPs)

IDENTIFICATION NUMBER:	PROCEDURE TITLE:
1-31000-COOP	Conduct of Operations
1-B37-HSP-12.08	Excavation and Trenching
1-C91-EPR-SW.01	Control and Disposition of Incidental Waters
1-NO8-HSP-21.04	Emergency Response and Spill Control Procedure
2-S47-ER-ADM-05.14	Use of Field Logbooks and Forms
3-21000-ADM-16.01	Occurrence Reporting
3-21000-ADM-18.03	Readiness Review
4-V80-ROI-4.02	Procedure for High and Low Volume Air Sampling
Procedure No. FO.1, Rev. 3	Air Monitoring and Particulate Control
5-21000-OPS-FO.03	Field Decontamination Operations
5-21000-OPS-FO.04	Decontamination of Equipment at Decontamination Facilities
5-21000-OPS-FO.06	Handling of Personal Protective Equipment
5-21000-OPS-FO.12	Decontamination Facility Operations
5-21000-OPS-FO.15	Photoionization and Flame Ionization Detectors
1-C88-WP1027-NONRAD	Nonradioactive waste packaging
1-M12-WO-4034	Radioactive Waste Packaging Requirements
4-D99-WO-1100	Solid Radioactive Waste Packaging
1-C80-WO-1102-WRT	Waste/Residue Traveler Instructions
1-MAN-011-SWODM	Sanitary Waste Off-Site Disposal Manual
1-PRO-573-SWODP	Sanitary Waste Off-Site Procedures
1-I34-WO-1103-NRWOL	Non-Routine Waste Origination Log Instructions
94-RWP-EWQA-0014, Rev. 1	Low Level Waste Management Plan

1.0 INTRODUCTION

This Field Implementation Plan (FIP) describes in detail the tasks and procedures required to complete the Trench 1 - Individual Hazardous Substance Site (IHSS) 108 source removal action by September 30, 1998. The purpose of the Trench 1 Source Removal Project is to excavate drums containing depleted uranium chips and machine turnings, associated radiologically contaminated soil, and other wastes and debris buried in Trench 1. All soil contaminated above the Tier I subsurface action levels for radionuclides and volatile organic compounds, as specified in the Rocky Flats Corrective Action (RFCA) (DOE, 1996), will be removed from the trench. The depleted uranium materials will be treated to address their potential pyrophoricity. The associated contaminated soil, debris, and other buried materials will be treated, if necessary, and staged for off-site disposal. The Trench 1 Source Removal Project is a mission activity, MP-ER-__, at the Rocky Flats Environmental Technology Site (RFETS) to reduce the human health and environmental risk associated with the buried radioactive contamination on behalf of Kaiser-Hill Company, Inc., (K-H) for the U.S. Department of Energy/Rocky Flats Field Office (DOE/RFFO).

The work control documents for this project are the Proposed Action Memorandum (PAM) for the Source Removal at Trench 1, IHSS 108 (RMRS, 1997a), the Sampling Analysis Plan (SAP) to Support the Source Removal at Trench 1, IHSS 108, (RMRS, 1997b), the task-specific Health and Safety Plan for the Source Removal at Trench 1, IHSS 108, (RMRS, 1997c), the Integrated Work Control Package number _____, as well as DOE Orders, RFETS policies and procedures, and Environmental Restoration Operating Procedures (OPs). Conduct of Operations (COOP) will be conducted in a manner consistent with RFETS goals, objectives, and approved procedures in accordance with DOE Order 5480.19. Implementation of COOP for the Trench 1 Source Removal Project is summarized in Appendix A.

2.0 SITE LAYOUT AND DEVELOPMENT

The following site maps show the approximate location of the following principal features:

Figure 2.1: Trench 1 Site Location Map
- Trench 1, IHSS 108 location

Figure 2.2: Trench 1 Source Removal Project Excavation Map
- Trench 1 Boundary
- Contamination Area (CA)
- High Contamination Area (HCA)
- Contamination Reduction Zone (CRZ)
- Stepoff pad/Radiological Buffer Area (RBA)
- Project Support Zone (PSZ)
- Primary and Secondary Assembly areas
- Project field trailers
- 1,800 gallon potable water holding tank (PW)
- 1,800 gallon incidental water holding tank (IW)
- Emergency eyewash/shower
- Traffic closure points

Figure 2.3: Trench 1 Source Removal Project Consolidated Soil Stockpile Area
- Consolidated Soil Stockpile (CSS) area
- 1,500 KVA electrical substation
- Trailer T900D to be used as the site project/staging office
- Trailer T900C to be used for project support
- Exclusion Zone/Soil Contamination Area (EZ/SCA)
- Contamination Reduction Zone (CRZ)

- Stepoff pad/Radiological Buffer Area (RBA)
- Primary and Secondary Assembly areas
- Supplied breathing air trailer
- 1,800 gallon potable water holding tank (PW)
- 1,800 gallon incidental water holding tank (IW)
- Emergency Eyewash/Shower
- Traffic closure points
- Heavy Equipment Survey Area

Figure 2.4: Trench 1 Material Segregation and Treatment Enclosure
- **To be completed**

Figure 2.1 Trench 1 Site Location Map

Figure 2.2 Trench 1 Source Removal Project Excavation Map

Figure 2.3 Trench 1 Source Removal Project Consolidated Soil Stockpile Area

Figure 2.4 Trench 1 Material Segregation and Treatment Enclosure

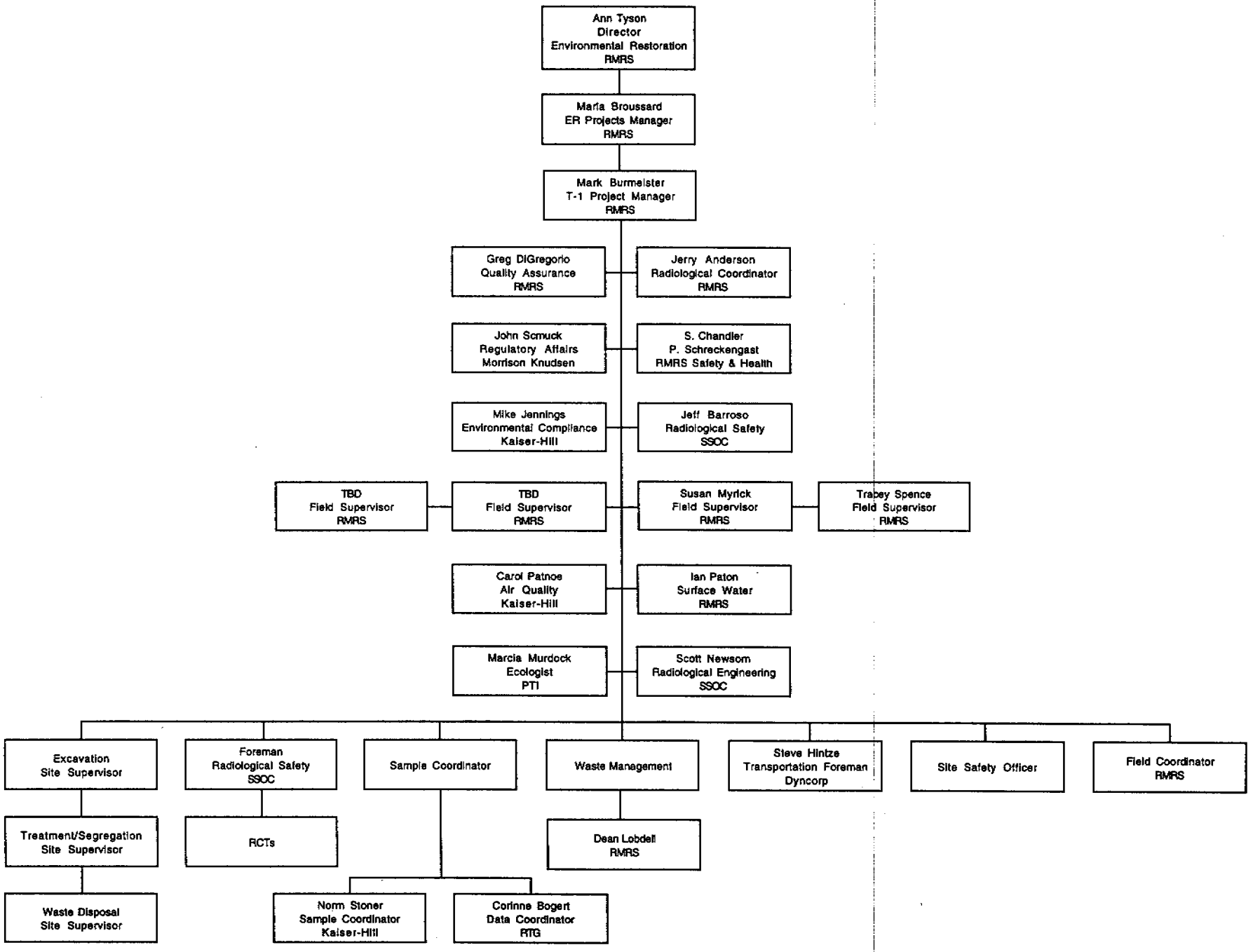
3.0 PROJECT ORGANIZATION AND PLANT SUPPORT

The project organization is presented in Figure 3.1 and shows the responsible project personnel, subcontractors and plant support contacts. Roles and responsibilities are the same as described in the HASP (RMRS, 1997c). Rocky Mountain Remediation Services, L.L.C. (RMRS) has planned and will manage the project and coordinate support for this accelerated source removal action through the appropriate RFETS contractor or subcontractor.

Trench 1 excavation activities will be assisted by collective bargaining unit personnel from DynCorp of Colorado, Inc. (DynCorp). Specifically, DynCorp/Transportation will assist by providing heavy equipment operators, laborers, some of the heavy equipment, fuel for the heavy equipment, transportation of materials and supplies to the site, transportation of empty waste containers to the site, and transportation of full waste containers to designated storage units. The waste stabilization/encapsulation operations and low temperature thermal desorption unit (TDU) treatment operations, if needed, will be performed by the subcontractor, _____. Safe Sites of Colorado, Inc., (SSOC) will provide radiological safety support for the project per the RFETS Radiological Control Manual (K-H, 1996). Resource Technologies Group, Inc., (RTG) is subcontracted to support the project by providing industrial hygienists, a data coordinator, and decontamination and potable water services.

K-H Environmental Compliance will assist with requirements for air monitoring and ecological support for the project. Collective bargaining unit personnel will be used when required to complete specific hookups or mobilizations per the scope of their contract and the Davis-Bacon determination.

FIGURE 3.1
Project Organization



4.0 SITE PREPARATION

Site preparation for the Trench 1 Source Removal project will include the following activities:

1) placing clean fill material and grading, as necessary, at the designated soil stockpile area, the material segregation and treatment area, and the area immediately south of Trench 1;

2) constructing a temporary structure over the material segregation and treatment area;

3) removing an RFETS security bunker adjacent to the north side of Trench 1 and constructing a soil berm around the excavation and soil stockpile areas to control stormwater run-on/run-off;

4) installing, as necessary, barriers, safety fences, wind screens, ropes, warning/hazard signs, and hazard tape to protect personnel/equipment or to control access to hazardous or controlled areas. Placement of fill material and grading will be performed as necessary to provide a level working area during excavation and material handling operations; and

5) staging miscellaneous equipment, and constructing secondary containments for incidental water holding tanks and placing/positioning the incidental water tanks and potable water tanks at the excavation site and the soil stockpile area.

In preparation for the Mound Site Source Removal project, the upper 6 inches of topsoil was stripped from the Mound Site and the consolidated soil stockpile area and stockpiled northwest of the stockpile area. In addition, the Central Avenue ditch culvert was extended (in March 1997) to control surface water and groundwater infiltration into the Mound Site excavation area. At completion of the culvert installation and Mound Site project, the area located north of Trench 1 was backfilled and graded, providing a level surface area north of the Trench 1 site. This area is intended to be used for constructing the material segregation and treatment structure due to its close proximity to the trench. A project support trailer and two cargo conexes will be situated in the vicinity of the trench excavation area following the fill and grading activities.

Site preparation of the soil stockpile area will consist of installing a french drain and sump storm water collection system, and staging concrete "jersey" barriers. The soil stockpile area will have dimensions of approximately 150 feet by 160 feet and will be bounded by concrete barriers (Figure 4.1). Features of the soil stockpile include the following:

- A plastic-lined, gravel-filled French Drain and an incidental water collection sump will be installed at the perimeter. Accumulated storm water will be collected from the incidental water collection sump located at the northeast corner of the French Drain using a sump pump or equivalent. The French Drain will be installed to collect potentially contaminated run-off and prevent run-on due to natural precipitation. An incidental water holding tank will be installed southeast of the stockpile area to receive water pumped from the collection sump (Figure 4.1).

- Jersey barriers will be installed within the gravel-filled drain, around three sides to contain the contaminated soil, which will minimize the commingling of storm water run-on with contaminated soil and minimize wind blown dispersion of soil.

- The existing topsoil stockpile and contaminated soil stockpiles will have dust suppression cover material, or equivalent, placed as described in Section 7.1.2.

Site preparation activities for the soil stockpile area will be performed in accordance with the Radiological Work Permit (RWP), and the requirements of the Phase I Site Preparation of the Soil Stockpile IWCP XXXXXXXX-X.

Figure 4.1 Consolidated Soil Stockpile Area

5.0 HEALTH AND SAFETY

The RMRS Site-Specific Health and Safety Plan (HASP) for the Source Removal at Trench 1 (RMRS, 1997c) is the lead document for worker safety. This includes all collective bargaining unit, subcontractor, other site personnel, and RMRS personnel. RMRS will conduct training specific to the supplied air equipment used at the site, and specialized training for safe handling, fire prevention and fire suppression of depleted uranium, before initiation of field activities. In the event that unanticipated hazards or conditions are encountered, as described in the HASP (RMRS, 1997c), the "Check List for Restart of Trench 1 Operations" will be filled out by the Project Manager (Appendix D). Activity Hazard Analyses or modifications to the HASP (RMRS, 1997c) will be prepared to address new hazards or conditions that are identified. The treatment subcontractor will prepare a site-specific HASP to address the expected and unexpected hazards or conditions associated with their operations. The subcontractor HASP will be reviewed and approved by the appropriate K-H, SSOC, and RMRS personnel.

Figures 2.2 and 2.3 show the approximate site layout of the EZ, CA, HCA, RBA, CRZ, and PSZ per the site specific HASP (RMRS, 1997c). Figure 2.4 shows the approximate layout of the treatment EZ, CRZ, and PSZ per the site specific HASP for treatment. The EZ is defined as the area of the project site requiring the most restrictive Personal Protective Equipment (PPE) for access. The CRZ and stepoff pad/radiological buffer areas are defined as the areas used for access to and egress from the EZ. The CRZ will be utilized for equipment and material staging, the mobile decontamination pad if needed, and equipment refueling. The PSZ is defined as the project area requiring site specific training for unescorted access or escorted access if lacking site specific training. Project specific training required for the implementation of the Trench 1 Source Removal is described in detail in the HASP (RMRS, 1997c) and a project-specific training matrix will be prepared as part of the RMRS Readiness Review Checklist (ADM-18.03).

Project personnel will be required to obtain a project access pass and use the sign in/out log at T900D prior to site access to the CRZ, RBA, or EZ. Visitors requiring unescorted access to the PSZ must use the sign in/out log at T900D and obtain a project access pass from T900D. To obtain a project access pass, project personnel will be authorized by the Project Manager, Field Supervisor, or Site Safety Officer after documenting completion of all applicable training requirements. Personnel entering the EZ will comply with the requirements of the task-specific RWP and will be trained in the use of the site-specific breathing air equipment. Visitors will be required to be escorted while in the PSZ, if all the site specific training requirements have not been met.

The following personnel and equipment have been identified within the EZ, CRZ, and PSZ at the excavation, consolidated soil stockpile area, material segregation and treatment enclosure, and the waste container storage area. Some personnel may have multiple roles (e.g., RMRS Field Supervisors supervising both excavation and stockpiling activities).

Excavation support and CSS staging personnel:
- RMRS Excavation and CSS Field Supervisor(s)
- An excavator operator
- A front-end loader operator that will also operate the dump truck
- An excavation spotter
- One to two Radiological Control Technicians (RCTs) to perform radiological monitoring of excavated soil
- RMRS Industrial Hygiene – air monitoring for volatile organics and particulate emissions
- Sample team, as needed, for boundary verification sampling

Excavation equipment:
- One, one to two cubic yard (cy) bucket tracked excavator or equivalent
- One 4 cy bucket front end loader or equivalent
- One 12 cy dump truck or equivalent
- One all-terrain forklift
- Two to four steel DU material carriers (hoppers)

The following air equipment or equivalent will be used by RMRS in support of the excavation and CSS staging activities. Quantities are approximated:
- Eight, MSA Quickfill Self Contained Breathing Apparatus (SCBA) units
- Eight, MSA Supplied Air Respirators
- Three or four high pressure regulators, one each for equipment operators, one for each of the cascade breathing air systems
- Two to four high pressure pigtails
- Three 1/4-inch by 50 foot (ft) high pressure refill hose
- Four 1/4-inch by 50 ft airline hose
- Two manifold airline assembly
- Two cascade fittings
- Two 24 cylinder breathing air trailers or equivalent
- Four 3500 pounds per square inch (psi, 310 cf) or equivalent air cylinders mounted on the heavy equipment
- Four low pressure alarms, one each for equipment operators and one for the cascade system
- Miscellaneous connections and equipment

The following personnel and equipment will be used within the excavation and CSS staging CRZ or stepoff pad radiological buffer area (RBA):
- One to two RCTs for the screening of personnel and equipment out of the EZ
- One laborer to brush off soil from the outside of the dump truck and provide dust suppression water, as needed
- On a limited basis, union personnel will be in the CRZ to refuel and repair the heavy equipment
- Sampling support personnel, as needed

The following personnel and equipment or equivalent will be used within the PSZ during excavation and CSS staging:
- One RMRS Site Field Supervisor or Project Manager
- One RMRS Site Safety Officer and/or RMRS Health and Safety Supervisor
- One to two RMRS Field Coordinator(s)
- One RMRS support person providing assistance with the supplied air quick connects, monitoring the supplied air trailer, and refilling air bottles as needed
- On a part-time basis, one RMRS support personnel
- SSOC Radiological Engineering or Safety support personnel
- One to two RCTs to perform high and low volume air sampling for radionuclides
- On an as-needed basis: subcontractor or vendor personnel delivering equipment, potable water, and picking up incidental or storm water

The following personnel and equipment have been identified within the treatment EZ and CRZ:
Treatment support personnel:
- RMRS TDU Field Supervisor, as needed
- RMRS TDU Site Safety Officer, as needed
- Subcontractor Quality Assurance (QA) Technician, as needed
- One to two subcontractor Health and Safety Specialists (HSSs) – organic vapor, radionuclide, and particulate air monitoring
- Two subcontractor Equipment Operators
- Five subcontractor technicians
- One subcontractor shift supervisor, as needed

Material Segregation and Treatment equipment or equivalent equipment:
- Two High Efficiency Air Filters (HEAF)
- Two High Efficiency Particulate Air (HEPA) filters
- Associated electrical system
- One forklift vehicle
- Other equipment as needed

The following personnel and equipment will be used within the treatment CRZ:
• One subcontractor HSS to screen of subcontractor personnel out of the EZ
• On a part-time basis, one RMRS support person to provide assistance with the supplied air quick connects

The following personnel and equipment or functional equivalent will be used within the Project Support Zone (PSZ) during treatment:
• One RMRS Site Field Supervisor
• One RMRS Site Safety Officer and/or RMRS Health and Safety Supervisor
• SSOC Radiological Engineering and Safety personnel
• Personnel to refuel the heavy equipment, as needed
• On an as-needed basis: subcontractor or vendor personnel delivering equipment, propane, potable water, and picking up condensate and or storm water
• One subcontractor project superintendent
• One subcontractor Site Safety Officer
• Two subcontractor HSSs for high and low volume air sampling for radionuclides, particulate monitoring and VOC perimeter monitoring
• Subcontractor personnel to stage additional equipment, as necessary
• Two 10,000 gallon tanks for storage of condensate and storm water
• One 1500 KVA skid mounted substation in the PSZ for electrical power
• One to two 24 cylinder air trailer(s)
• Eight 1,000 gallon Liquid Propane Gas storage tanks
• Additional above-ground storage tanks, as needed to support dust suppression activities or manage incidental waters

The following personnel and equipment have been identified with the backfilling operations:
Backfilling personnel:
• RMRS Field Supervisor(s)
• Two front-end loader operators
• One to two dump truck operators
• Backfilling spotter
• Two laborers providing dust suppression using water
• Radiological Control Technicians (RCTs), radiological monitoring of equipment and personnel out of the EZ
• SSOC Radiological Engineering and Safety personnel
• RCTs performing high and low volume air sampling for radionuclides
• RMRS Industrial Hygiene – air monitoring for particulate emissions

Backfill equipment:
• One to two 4 cy bucket front end loaders or equivalent
• One to two 12 cy dump truck or equivalent

Radiological high volume and low volume air monitoring equipment will be supplied by SSOC Radiological Engineering in support of the source removal action. High volume and low volume air sampling for particulate radionuclides will be performed as directed by SSOC Radiological Engineering (Appendix C). Approximately two high-volume air sampling stations will be set up downwind from the following site activities: excavation; stockpiling soil in the CSS, soil treatment (if necessary), and backfilling, as needed. Locations will be determined by the wind direction at any given time during the evolution of the above activities. High volume and low volume air sampling will be performed to establish baseline airborne concentrations of particulate radionuclides and resultant airborne concentrations from soil movement activities during soil excavation, soil stockpiling, soil treatment, and if required during backfilling of treated soil. Sampling frequencies and radon discrimination are detailed in the task-specific As Low As Reasonably Achievable (ALARA) job review (Appendix C).

6.0 PUBLIC AND MEDIA RELATIONS

The public and media relations will be coordinated through Ann Tyson, RMRS, and Ann Sieben, K-H. A project sign will be installed at the southeast corner of the project site. RMRS Trench 1 project personnel will coordinate with the on-site subcontractor for photographic support and documentation. Visitor access control to the site will be in accordance with Section 5.0 of this FIP.

7.0 SOURCE REMOVAL ACTION

The Trench 1 source removal action will involve excavating the drums containing depleted uranium wastes, and excavating any debris and potentially contaminated soil buried in the trench. The potentially pyrophoric depleted uranium wastes will be treated to remove the hazard of pyrophoricity and packaged for off-site disposal. Other wastes encountered in the trench will be excavated, sampled, treated as necessary, and staged for appropriate off-site disposal. Excavated soil will be segregated, sampled and staged for disposal or reuse as backfill material. The source removal activities will be performed as described below in accordance with the HASP, the task-specific RWPs, and the task-specific IWCPs.

7.1 EXCAVATION

Excavation activities will consist of excavating, transporting, and staging of all soil, depleted uranium chips/turnings in drums, miscellaneous trash and debris, and any other wastes that may be buried in the trench. It is estimated that Trench 1 contains from 1,000 to 1,500 cubic yards of material including the drums, miscellaneous debris and trash, and soil deposits used to backfill the trench.

The trench contents will be excavated primarily with a track-mounted excavator equipped with a one or two-cubic yard bucket, and if needed a backhoe and/or front-end loader. Excavation will likely proceed from the east (predominantly downwind) end of the trench towards the west end of the trench, with the excavator positioned on top of the trench.

Based on contamination screening results, excavated soil will be segregated and transported to the soil stockpile area in a dump truck or in roll-off containers (or similar containers). Drums will be containerized and transported to the material segregation and treatment enclosure to evaluate and manage the drum contents. Debris will be containerized and transported to a temporary staging area and managed for offsite disposal. The IWCP (**document number**) for excavation, outlines the procedures and steps for performing the excavation tasks.

At least one spotter will assist the excavator operator from the side of the excavation in positioning the excavator over the trench and locating the excavator bucket inside the excavation. The spotter will communicate with the operator using a hand-held radio and/or hand signals. Once the excavation reaches a depth of four feet, a health and safety restricted zone of six feet from the edge of the excavation will be maintained for fall protection per Occupation Safety and Health Administration (OSHA) regulations and the site specific HASP (RMRS, 1997c). If personnel are required to get closer than six feet to the edge of the excavation, personnel restraints using a full body harness and appropriate hookups to a jersey barrier or equivalent fixed body will be used.

Other project personnel will maintain a safe distance of 20 feet from the excavator during operation. Project personnel can approach the excavator after eye contact, the appropriate hand signals have been given and/or radio communication, and the operator has placed the bucket on the ground.

To limit the extent of open trench, the trench excavation may be backfilled as the excavation is advanced. This will be dependent upon the conditions encountered inside the trench. The excavation will be secured with appropriate barricades, chain-link fence, or equivalent, to prevent unauthorized entry to the excavation. Prior to backfilling, excavation boundary sampling will be performed as described in Section 7.1.1. The open excavation will be inspected periodically until the excavation is backfilled during site reclamation activities (see Section 7.3). When the excavation is inactive, such as during downtime or the end of work shifts, any exposed drums and waste material in the trench will be covered with soil.

The excavation will be limited to the contents of the trench and any contaminated soil encountered to the depth of highly weathered bedrock, one to three feet below the alluvial/bedrock contact, or to the depth of groundwater, if encountered. Unweathered bedrock will not be excavated.

Work within the Exclusion Zone will be performed in Level B protective equipment, or as designated in the HASP (RMRS, 1997c). The HASP outlines the health and environmental monitoring that will be conducted during the excavation activities. Decontamination and radiological surveying of excavation equipment and personnel will be performed according to the procedures outlined in Section ____ of the HASP.

Soil

The excavated soil will be raised in the excavator bucket and the bucket will be placed on the ground. Soil in the bucket will be screened for levels of radiological and VOC contamination, and segregated based on the screening results (see Figure 7.1). The soil will be radiologically screened using a Field Instrument for the Detection of Low-Energy Radiation (FIDLER) per the RFETS Radiological Operating Instructions and the SAP (RMRS, 1997b). An organic vapor analyzer (OVA), or similar instrument, with a flame-ionization detector (FID) and photo-ionization detector (PID) (with 10.6 eV lamp) will be used to screen for VOC contamination.

Soil with less than 100,000 cpm with the FIDLER and less than five ppm VOCs, and soil with less than 100,000 cpm with the FIDLER and VOCs detected greater than or equal to five ppm will be segregated and placed directly into a dump truck for transport to the CSS. These soils will be stockpiled and segregated in the CSS with concrete jersey barriers and covered with a dust suppression agent to prevent particulate dispersion. The soils will be sampled for confirmatory testing in accordance with the SAP (RMRS, 1997b).

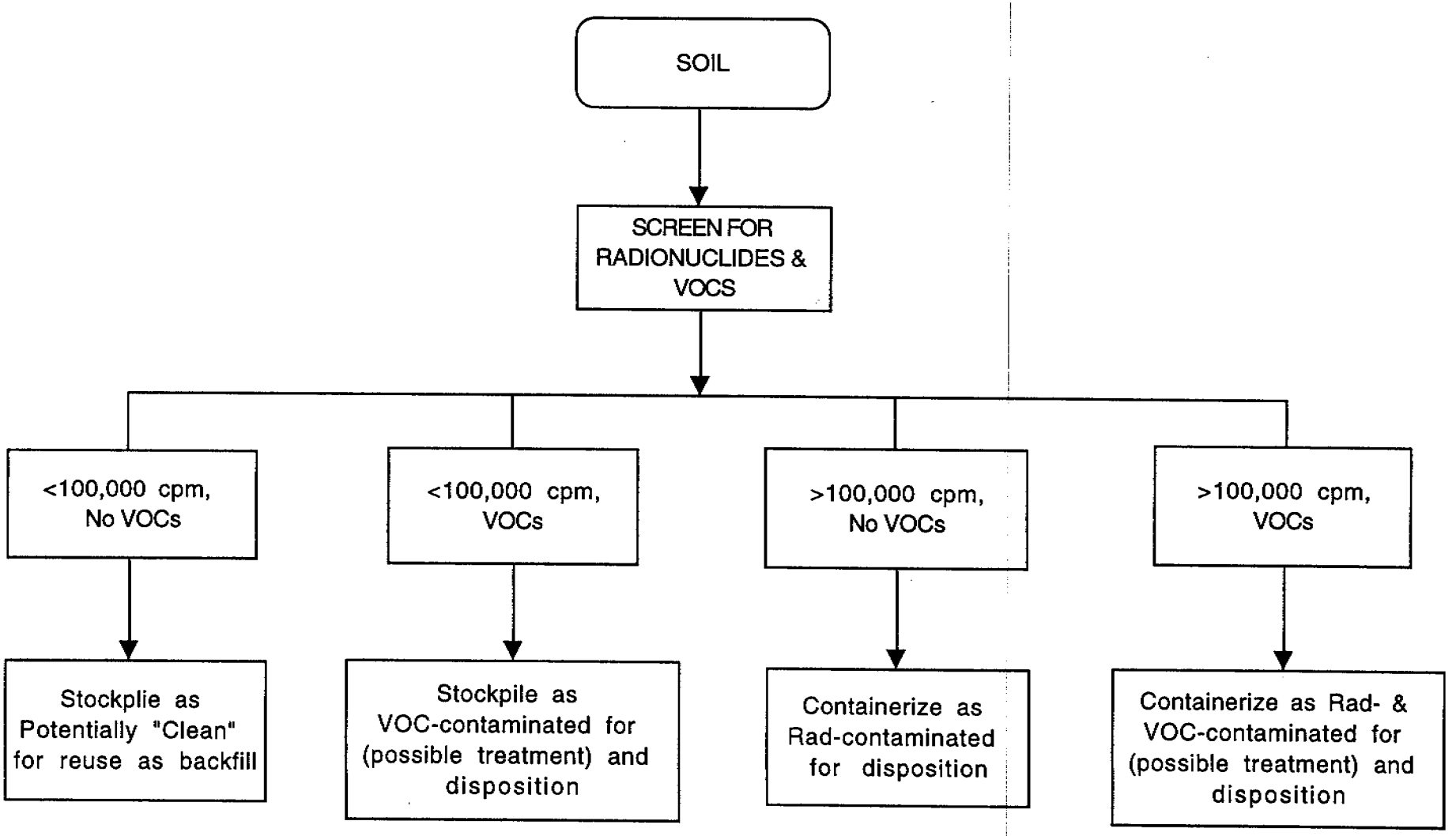
Soil exhibiting greater than 100,000 cpm with the FIDLER and less than five ppm VOCs, and soil with greater than 100,000 cpm with the FIDLER and VOCs detected greater than or equal to five ppm will be segregated and placed directly into roll-off containers. These soils will be staged near the CSS in the containers and sampled in accordance with the SAP (RMRS, 1997b) to determine final disposition.

A screening level of 100,000 cpm on the FIDLER has been set as a conservative break point for soils and debris removed from Trench 1. Soils at this level should contain DOE radionuclides at concentrations below the Tier I action levels. The 100,000 cpm decision level was set based on:

- process knowledge of the FIDLER and its response to DOE radionuclides;
- past experience with RFETS soils contaminated with depleted uranium; and
- previous project experience comparing FIDLER soil screening results to soil radiological analytical results.

FIGURE 7.1

SOIL SEGREGATION EVALUATION DIAGRAM
(All segregated soil will be sampled for confirmatory testing in accordance with the SAP)



All soils will be sampled for compliance with Tier I radionuclide action levels, soils with less than as well as soils with greater than 100,000 cpm detected with the FIDLER. Soil encountered with greater than 100,000 cpm detected with the FIDLER will trigger a radiological project hold point. Radiological evaluation will be performed by SSOC Radiological Engineering, SSOC Radiation Safety, RMRS Management and the RMRS Radiological Coordinator, and K-H Program Management before excavation activities can resume.

The outer sides of the dump truck and roll-off containers, if used, will be visibly inspected by site personnel and brushed clean of any loose soil while in the EZ. A fill line will be denoted by project personnel on the inside of the dump truck bed and the inside of each roll-off container for assistance in proper filling by the excavator operator. The filled dump truck and/or roll-off containers will be moved up to the radiological survey area where they will be monitored out of the EZ by the RCT per the RWP. In the event that unanticipated hazards or conditions are encountered, as described in the HASP (RMRS, 1997c), the "Check List for Restart of Trench 1 Operations" will be completed by the Project Manager (Appendix D).

Drums

All drums encountered in the trench will be removed from the trench individually, in order to minimize exposure to workers, the environment, and the public. The drums will be exposed one row at a time, so that the maximum number of drums exposed at any one time will be 12, assuming the drums are stacked two high in rows of six drums across (information obtained from former Rocky Flats employees associated with burial of wastes in Trench 1). A detailed evaluation of this bounding condition is provided in the Auditable Safety Analysis for Individual Hazardous Substance Site (IHSS) 108 Trench 1 Source Removal Project (Appendix I).

Prior to removal from the trench, the drum lid of each intact drum will be loosened using the excavator bucket to ensure the drum lid is not sealed. The excavator bucket will be equipped with brass or bronze attachments to minimize spark-potential. A device will be used with the excavator bucket to completely cover the intact drum, and pierce the drum lid to vent any potential hydrogen gas build-up inside the drum. The device will be used inside the trench prior to removal of the drum from the trench. The excavator may be equipped with a blast shield when handling buried drums.

Each drum will be maneuvered into the excavator bucket and placed into a steel waste transfer container (hopper) adjacent to the excavation for radiation surveying, VOC screening, and heat testing. If the radiation survey determines that the drummed material has a gamma or beta exposure rate of greater than 100 millirem per hour (mrem/hr) at 30 centimeters, work stoppage will occur for further evaluation and the work area will be posted as "High Radiation Area". Heat testing will be performed by examining each drum with a heat-sensitive "heat gun" as utilized by fire protection agencies. Appropriate coolants and fire controls may be used if the heat test is positive (e.g., an increase in drum temperature is observed). The hopper will then be transported using a forklift vehicle to the material segregation and treatment enclosure for further evaluation and handling of the drum contents, as discussed in Sections 7.2 and 7.3.

If the drums are not intact, then approximately one cubic yard of the depleted uranium and associated material will be removed from the trench at a time and placed directly into the steel hopper. The material will undergo the same contamination screening and heat testing as described above for intact drums before being transferred to the enclosure. The hopper lid will be closed during transport from the excavation to the enclosure. The enclosure will be constructed in close proximity to the excavation. See Section 7.2 for a detailed description of the material segregation and treatment enclosure.

In addition to the drums containing depleted uranium, historical drum inventory lists for Trench 1 indicate that one 55-gallon drum containing "still bottoms" and ten 55-gallon drums of cemented cyanide waste, originating from Building 444, were buried in the trench. Based on historical records and Building 444 process knowledge, the "still bottoms" could potentially consist of either lathe coolant oil sludge or residual trichloroethene and perchloroethene waste solvents and sludge generated from machined parts cleaning. If encountered, the drums containing "still bottoms" and cemented cyanide will be transferred in the hopper to the material segregation and treatment enclosure for evaluation and management.

Debris, Unknown Materials, and Suspected Artifacts

Miscellaneous debris and trash excavated from the trench are expected to include compatible materials such as personal protective equipment, wood, metal, rubber, plastics, paper, and glass. Immediately following removal from the trench, these items will be visually inspected for stains or discolorations and surveyed and screened for radiological and VOC contamination, respectively. These materials will be segregated adjacent to the excavation and packaged appropriately with like waste forms for transport to a staging area.

Materials which cannot be immediately identified will be screened for radiological and VOC contamination, containerized, and sampled in accordance with the SAP (RMRS, 1997b) to identify the contents. If the radiation survey determines that the materials have a gamma or beta exposure rate of greater than 100 mrem/hr at 30 centimeters, work stoppage will occur for further evaluation and the work area will be posted as "High Radiation Area". Materials contaminated with VOCs will be segregated, containerized, and staged for interim storage inside a temporary unit. Appendix H presents the instructions/guidelines and checklist for identification and dispositioning of unknown materials.

Artifacts suspected of being "classified" items will be surveyed for radioactivity and inspected to ensure safe handling. The items will be isolated and the RFETS Classification Office will be contacted to remove the artifact and store it in a secure location (see instructions provided in Appendix G).

Any containers with liquids and/or sludge, if encountered, will be inspected for labels, markings, or other information which may indicate its contents. The container will be screened for radiological and VOC contamination and will be re-packaged if required, in order to ensure container integrity. After container integrity is assured, the container will be transferred to the material segregation and treatment enclosure to identify the liquids/sludge according to the SAP (RMRS, 1997b).

7.1.1 EXCAVATION VERIFICATION SAMPLING

At the completion of excavation operations, verification soil samples will be collected along the base and sides of the excavation to determine the post-action condition of the subsurface soils. Verification samples will be collected and analyzed according to the procedures and requirements stated in the SAP (RMRS, 1997b). The sampling will be performed after a nominal six-inch scrape below the drums and debris to clear the trench bottom of any residual waste material. Visible staining which may extend beneath the trench bottom will also be removed prior to collecting samples. If sample analytical results indicate that contamination is present above cleanup target levels, further excavation and sampling will continue until cleanup target levels are achieved, or one of the limiting conditions discussed below are met.

If contamination is encountered below the bottom of the trench, the excavation will be limited to the highly weathered bedrock, one to three feet below the alluvial/bedrock contact, or to the depth of groundwater, if encountered. Unweathered bedrock will not be excavated. An OVA with FID and PID detectors (with 10.6 eV lamp) and a FIDLER will be used as field screening tools to guide the excavation activities before collection of the excavation verification samples.

Cleanup target levels used for the excavation activities are the RFCA Tier I soil action levels (DOE, 1996) for radionuclides, cyanide, and VOCs, if encountered. These action levels were incorporated to reduce risk to future site workers and users of the site, and to prevent degradation of groundwater quality above the RFCA Tier I groundwater action levels (DOE, 1996). Table 7-1 lists the radionuclide, VOC, and cyanide cleanup target levels (DOE, 1996). The contaminants listed in Table 7-1 are the potential chemicals of concern for the project. This list was developed by assessing the historical data, retired worker interviews, and waste records from the site, and by use of process knowledge to ascertain what contaminants existed in the drums that were initially buried at the site.

TABLE 7-1
CONTAMINANTS OF CONCERN
CLEANUP TARGET LEVELS FOR EXCAVATION

Contaminant	Activity or Concentration
Uranium-238 (U-238)	586 pCi/g
Cyanide	154,000 mg/kg
Tetrachloroethene (PCE)	11.5 mg/kg
Trichloroethene (TCE)	9.27 mg/kg

pCi/g = picocuries per gram
mg/kg = milligram per kilogram

7.1.2 MANAGEMENT OF THE CONTAMINATED SOIL STOCKPILE AREA

Soil excavated from Trench 1 will be placed in the consolidated soil stockpile (CSS) area for temporary storage until treatment or final disposition is determined (Figure 2.3). The CSS will be maintained during excavation and treatment operations as described below.

Soil will be segregated within the CSS as described in Section 7.1. Soil stockpiles will be designated for soil contaminated with radionuclides and, if encountered, soil contaminated with radionuclides and/or VOCs. The stockpiled soil will be segregated with concrete barriers. All stockpiled soil will be covered with a dust suppression agent (e.g., ConCover or equivalent) when soil is not being actively added to, or removed from, the active portion of the stockpiles. The cover material will be applied with a spraying machine and will be capable of lasting from several weeks to six months, depending on application and weather conditions. The RMRS field supervisor will be responsible for visually inspecting the condition of the cover material placed on the stockpiles during daily operations. If weather conditions cause "bare spots" to develop on the stockpiles, additional dust suppression agent will be applied to the stockpiles until approved by the RMRS field supervisor.

Storm water collected from the french drain may be used to control dust on the radiologically and VOC contaminated soils awaiting final disposition and/or treatment (see Section 4.0 for description of the french drain). Any remaining unused water will be handled as incidental water and evaluated per the procedure "Control and Disposition of Incidental Waters, 1-C91-EPR-SW.01". Evaluation consists of analysis for gross alpha and gross beta radioactivity, conductivity, nitrates, pH, and

volatile organic compounds. Additional analyses may be performed as specified in the SAP (RMRS, 1997b). If incidental water is found to be contaminated per SW.01 and/or contains VOCs equal to or greater than the RFCA surface water standards for Segment 5, incidental water will be sent to the CWTF for treatment.

After all stockpiled soil has been removed from the CSS for final disposition, samples of surface soil beneath the CSS will be collected in accordance with the procedures described in the SAP (RMRS, 1997b). Any contaminated soil beneath the CSS will be removed by a front-end loader or equivalent and managed for appropriate disposal. Additional samples will be collected to verify all contamination has been removed.

7.1.3 MANAGEMENT OF INCIDENTAL WATERS

Incidental waters encountered as a result of storm water or groundwater entering and collecting in the excavation will be removed from the excavation if sufficient volume is present to impact operations, and transferred to a temporary storage container near the excavation. Surface water monitoring will be performed during excavation activities using existing automated stations near the site, and storm water run-on and run-off around the excavation will be controlled with use of a soil berm. Based on historical groundwater level measurements in the vicinity of Trench 1, groundwater is not expected to be encountered during excavation activities. Before excavation, groundwater levels from the nearby monitoring wells will be measured to establish the depth to the unconfined water table.

Water collected from the excavation or from within the bermed areas, if any, will be managed as incidental waters per site procedure Control and Disposition of Incidental Waters, 1-C91-EPR SW.01. Evaluation consists of analysis for gross alpha and gross beta radioactivity, conductivity, nitrates, pH, and volatile organic compounds. Additional analyses may be performed as specified in the SAP (RMRS, 1997b). If the water is found to be contaminated per procedure 1-C91-EPR SW.01 and contains volatile organic compounds greater than the RFCA surface water standards for Segment 5, the water will be treated in the Consolidated Water Treatment Facility (CWTF) located in Building 891. Following treatment, the water will be sampled and released in accordance with discharge criteria.

7.1.4 AMBIENT AIR MONITORING

Radiological high volume and low volume air sampling for particulate radionuclides will be performed during periods of soil movement or other dust generating activities per the ALARA job review, as described in Section 5.0. In addition, the Kaiser-Hill Air Quality Management group maintains the RFETS Radioactive Ambient Air Monitoring Program (RAAMP) which monitors the perimeter of RFETS continuously with samples collected and analyzed on a monthly basis. The RAAMP sampling network also includes monitoring stations inside the perimeter of RFETS which are collected but not analyzed unless conditions warrant additional analysis. An enhanced, project-specific environmental air monitoring plan will be implemented during soil and debris handling and related treatment activities. The project-specific ambient air sampling program will consist of routine monitoring based on scheduled project activities, and event sampling, which would be implemented if a radionuclide release of concern was suspected based on project information or routine sampling results. Effluent monitoring will also be performed at the material segregation and treatment enclosure. These monitoring programs are described in detail in the Trench 1 Source Removal Air Monitoring Plan (K-H, 1997) attached as Appendix J.

Wind speed and direction will be monitored during field activities and particulate dust perimeter monitoring will be performed in accordance with the RFETS Environmental Restoration Field

Procedure FO.1 (Air Monitoring and Particulate Control) and the HASP (RMRS, 1997c). Monitoring for VOCs around the perimeter of the EZ will be performed in accordance with the HASP. During soil handling activities, dust minimization techniques such as water sprays will be used to control suspension of particulates. Dust suppression will be performed using a potable water spray or mist on the soil as it is excavated. Excavation activities will not be conducted during periods of sustained high wind as specified in FO.1 Air Monitoring and Particulate Control.

7.1.5 FIRE CONTROL AND FIRE SUPPRESSION

In the event of a depleted uranium fire, fire control and fire extinguishment will be conducted in accordance with the Fire and Emergency Services General Operating Guideline 3-FES-GOG-229, Pyrophoric Metals Fire Extinguishment (Appendix K). Appropriate fire control and fire suppression agents (e.g., sodium chloride based powder [MET-L-X], dry magnesium oxide powder, water) will be located immediately adjacent to the excavation site, and at locations where potentially pyrophoric depleted uranium material is handled and managed. All Trench 1 field personnel will be trained by the RFETS Fire Department in pyrophoric metals fire extinguishing techniques. The RFETS Fire Department will be notified immediately of any fire or other potential hazardous condition at the site, and is capable of responding to the Trench 1 site within two minutes of being contacted.

To minimize fire hazard, all depleted uranium and associated materials removed from the trench will be containerized and covered during transport from the trench to the material segregation and treatment enclosure. Once inside the enclosure, exposed depleted uranium will be handled in batches and, if necessary, sprayed with water or other appropriate material.

7.1.6 SOIL TRANSPORT AND TRAFFIC MANAGEMENT

A dump truck will be utilized to transport contaminated soil from the excavation area to the CSS. Due to the location of the excavation and treatment areas, a portion of the existing paved road on Central Avenue may be utilized (Figure 7.2). Dust minimization techniques to be utilized during soil transport include monitoring wind speed and direction (in accordance with Procedure FO.1) (Appendix E), applying potable water during soil excavation and loading to achieve a satisfactory moisture content but not to saturation, and reduce dump truck speed to five miles per hour. The exterior of the dump truck will be visually inspected and cleaned of any loose soil in the excavation site EZ prior to transport and radiologically surveyed prior to exiting the EZ. The dump truck will be visually monitored during transport to observe any potential spillage. Any soil tracked onto the paved roadway during field activities will be cleared prior to reopening to RFETS traffic. After dumping a load of soil and prior to exiting the soil stockpile area, the dump truck will be monitored out of the soil stockpile area EZ/SCA by the RCT as per the RWP.

Traffic will be diverted to the south two lanes of the East Access/Central Avenue Road at points east and west of where the road splits from the rest of the roadway. The northernmost westbound lane would be closed from the point to the east where the lane diverges to the point west of the Inner East Gate where the road rejoins the East Access/Central Avenue Road. During normal work days, the northernmost lane will remain open between 0630 and 0800 and 1500 to 1700 to address peak traffic flow. The northernmost lane would only be closed during periods of excavation between 0800 and 1500 or before or after peak traffic hours.

Excavation activities are scheduled to begin on _____. The northernmost lane will be closed from approximately _____. Lane closure will be achieved by placing a lane closure sign, flashing barricades, and traffic cones as shown on Figure 7.2. Access to the sewage treatment plant and northeast access roads on the inside and outside of the Inner Perimeter

Figure 7.2 Trench 1 Traffic Plan for Excavation and Backfilling Activities

Fence will not be blocked. However, traffic will be controlled during soil transport by placing flagmen approximately 100 to 200 feet north and south of the respective intersections to ensure safe movement of RFETS traffic and the dump truck transporting contaminated soil as shown on Figure 7.2. Prior to reopening the north lane of the East Access road the roadway will be cleared of any soil tracked onto the roadway. Similar traffic controls will be utilized during soil transport for backfilling as shown on Figure 7.2.

7.2 DEPLETED URANIUM MATERIAL SEGREGATION AND TREATMENT

A temporary material segregation and treatment (MST) enclosure will be constructed near the excavation site to provide a controlled environment for managing the depleted uranium and associated waste materials. All depleted uranium chips and turnings, and associated waste material will be transported directly from the excavation site to the MST enclosure for further evaluation, and material segregation and treatment. The depleted uranium and associated wastes are anticipated to be contained within intact steel drums and/or mixed with non-intact drum fragments, soil and other debris. Intact drums containing waste materials and deteriorated drums mixed with waste, soil and debris will be received inside the enclosure within a covered steel container (hopper). Once inside the enclosure, each drum and/or batch of waste inside the hopper will be evaluated and inventoried. Treatment will consist of a stabilization process to encapsulate the depleted uranium metal chips and turnings, any incidental radioactively contaminated soil, and other low-level radioactive soil and debris.

In addition, materials and items removed from the excavation area that require further investigation, analysis, container access, or other engineering controls will be managed in the MST enclosure. The MST enclosure will be used to access, identify, stabilize, unpackage, sample, and repackage unknown materials and suspected classified artifacts. Procedures for managing unknown materials and classified artifacts, if encountered, are described in the SAP (RMRS, 1997b).

The MST enclosure will be constructed with secondary containment for spill control, and will be equipped with a high-efficiency particulate air (HEPA) filter system to control potential airborne contaminants. The MST enclosure will be a self-supporting structure constructed of flame retardant materials designed to shed snow and withstand high winds and hail in accordance with RFETS building codes and standards. Work inside the MST enclosure will be performed in Level B protective clothing on supplied breathing air, or as designated in the HASP (RMRS, 1997c).

A summary of the depleted uranium waste segregation and treatment operations is provided below.

7.2.1 MATERIAL SEGREGATION

Intact drums received into the MST enclosure will be opened manually, inspected for labels, markings, color, and capacity, and documented for project inventory records. Drums identified as containing only uranium chips and turnings will be transferred to the treatment area and the contents will be encapsulated in a stabilization agent. These materials should be easily identifiable by visual inspection and radiation screening results. The depleted uranium turnings were typically generated through lathe machining operations in the form of very fine to coarse spiraled metal strands. Radiological activity levels from the intertwined uranium turnings packed in the drums are expected to range from a few nanocuries per gram (nCi/g) to several hundred nCi/g.

Liquids and sludge (e.g., potential "still bottoms"), if encountered in the drums, will be segregated from solids and containerized for characterization sampling. Bulk liquids or sludge observed in drums will be pumped or gravity-drained into a new container for sampling and interim storage within

a temporary unit. Upon receipt of analytical results, the liquids and/or sludge will be managed for appropriate treatment and/or disposal.

Remaining solid materials will be segregated according to the following waste types:

- depleted uranium chips and turnings
- debris
- wastes potentially containing hazardous constituents
- suspected classified artifacts, or
- unknown materials.

Depleted uranium chips and turnings will be transferred directly to the treatment area. Solid wastes potentially containing hazardous constituents (e.g., cemented cyanide) will be re-packaged and sampled according to the SAP (RMRS, 1997b). Sampling results will be used to verify the waste type and characterize the waste for applicable storage, disposal, and treatment options (if required), and/or resolve whether the present waste form is acceptable for disposal. Debris will be surveyed for radiological contamination and screened for VOC contamination. If determined to be a hazardous or mixed waste, the debris will be appropriately packaged for disposal. If determined to be low-level radioactive waste, the debris will be packaged appropriately with compatible wastes or will be encapsulated with the uranium wastes. Items suspected of being classified artifacts will be isolated and packaged appropriately. The RFETS Classification Office will be contacted to remove the artifact from the site. Emptied intact drums will be mechanically sized-reduced (e.g., using a drum crusher), if necessary, and treated with the uranium wastes, or will be appropriately packaged as mixed waste if hazardous constituents are identified.

If the hopper contains a mix of depleted uranium waste with corroded non-intact drum fragments, soil and/or other debris, the waste mixture will be removed from the hopper for coarse material separation, following initial evaluation and inventory. Large drum fragments and bulk soils will be separated from the uranium waste and staged within the enclosure for size reduction and treatment, if necessary. Any debris and items suspected of being classified artifacts will be segregated and managed as described above. The remaining uranium waste and solid material will be transferred to the treatment area.

7.2.2 TREATMENT

The potentially pyrophoric depleted uranium chips and turnings and associated contaminated soil and debris will be treated to remove the hazard of pyrophoricity. The waste will be treated through a stabilization or solidification process which involves mixing the waste with a stabilization agent to form a solid monolith. Encapsulation within the monolith will isolate the depleted uranium from oxygen and moisture, rendering it stable and non-reactive. Following stabilization, the monolith will be sampled according to the SAP (RMRS, 1997b) to support off-site disposal waste acceptance criteria, and will include analysis by EPA Toxicity Characteristic Leaching Procedure (TCLP) for metals, VOCs, and reactivity. The depleted uranium waste treatment activities will be conducted within the MST enclosure.

A description of the treatment process will be added here once it is available from the subcontractor.

If present, and of sufficient volume to warrant, VOC-contaminated soils and VOC-contaminated debris above Tier I action levels will be staged for treatment using low-temperature thermal desorption technology. If thermal desorption is used, the thermal desorption system will be similar to that

described in the Field Implementation Plan for the Source Removal at the Mound Site IHSS 113 (RMRS, 1997d). The soil and debris treatment performance goals for the VOCs and the process monitoring and process management will be as discussed for the Mound Site project (RMRS, 1997d).

7.3 SITE RECLAMATION

Site reclamation consists of three tasks, backfilling soil into the excavation, decontamination and demobilization of the project equipment, and revegetation. Radiological surveys of the equipment will be performed per the RFETS Radiological Operating Instructions prior to release from RFETS. Excavation, stabilization, and all other treatment support equipment will be decontaminated.

Backfilling of the excavation will commence upon confirmation that the excavation verification soil sample results meet or are below the Tier I RFCA action levels for radionuclides or VOCs stated in Table 3-1 of the PAM (RMRS, 1997a) and the radiological soil put back levels. Particulate dust monitoring will be performed during soil transport and backfilling activities. Dust suppression with potable water will be applied during soil transport and backfilling. When backfilling approaches less than four feet to ground surface, the front end loader will provide additional compaction by driving onto the excavation backfill. Excavated soil below action levels will be used. Clean fill will be utilized as needed. Radiological air sampling will be performed with high volume monitoring downwind and low volume monitoring along the perimeter of the excavation site during periods of soil movement or other dust generating activities in accordance with the ALARA review (Appendix C) (see Section 5.0).

Decontamination and demobilization of project support equipment and materials will commence on completion of treatment and backfilling operations. Regrading and replacement of topsoil stripped from the soil stockpile areas will be performed prior to revegetation. Revegetation of all disturbed areas in the project support zone will be performed in accordance with the guidance provided by ecologists as described in Appendix F and per the revegetation IWCP.

8.0 SPILL RESPONSE AND CONTAINMENT

The excavation, transport, and treatment activities may cause incidental spills of contaminated soil, hydraulic oil, motor fuel, or other hazardous materials. The following spill response procedures will be performed to contain, control, and cleanup incidental spills. This plan addresses how potential spills of contaminated soil or hazardous material will be handled by preplanning and following the Emergency Response and Spill Control Procedure (1-NO8-HSP-21.04) and Occurrence Reporting Procedure (ADM 16.01) and the RFETS incidental release response actions and occurrence reporting requirements (DOE Order 5000.3). The potential hazardous constituents have been identified on the basis of the site characterization data as summarized in the PAM (RMRS, 1997a).

Prompt notification of the project manager and the Shift Superintendent (extension 2914 or radio 3310) will be made reporting the type, volume, time, and spill response actions to be performed to contain the incidental release. If the spill involves potentially radioactive contaminated soil or materials, SSOC Radiological Safety and SSOC Radiological Engineering will also be notified. Project personnel are adequately trained and have the proper PPE and equipment to respond to most anticipated spills within the project site. The Shift Superintendent or a representative from the RFETS emergency response team will respond to the project site when notified of any incidental spill to observe the project teams spill response and cleanup.

In the event of an incidental spill of contaminated soil, hydraulic fluid, motor oil or fuels onto unpaved roadways, the material will be excavated with the front end loader or applicable equipment depending

on the volume of soil spilled and placed in the CSS. Project RCTs or HSSs will survey the area with appropriate instruments to ensure removal of any radiological contaminated soil. Radiological surveys performed in response to an incidental spill will be documented. In case of liquids, absorbent pads or materials will be used to contain and cleanup the spill, and impacted soil will be excavated and removed to the CSS along with the used absorbent materials.

In the event of an incidental spill of contaminated soil, hydraulic fluid, motor oil or fuels onto paved roadways, the material will be contained with shovels and brooms or other applicable equipment depending on the volume of soil or material spilled and placed in the CSS. Project RCTs will survey the area with appropriate instruments to ensure removal of any radiological contaminated materials. Radiological surveys performed in response to an incidental spill will be documented. In case of liquids, absorbent pads or materials will be used to contain and cleanup the spill as above.

Near the completion of the project, a visual survey for potential hydrocarbon contaminated soil will be performed at the excavation site and CSS area. Hydrocarbon impacted soil will be removed and sampled per the SAP (RMRS, 1997b) for appropriate characterization and disposition. In addition, a final radiological survey will be performed over the excavation and CSS areas using the similar grid spacing as the preliminary surveys. Any remaining soil which appears to be radiologically impacted will be removed, characterized and disposed of before regrading and site reclamation activities. If the release is not incidental and cleanup cannot be performed in a safe manner, the release requires implementation of the emergency spill response procedures per the site-specific HASP (RMRS, 1997c). In the event of any release outside the project area of a hazardous material, specifically an unknown hazardous waste or unknown radioactive material, the following actions will be taken:

- Personnel should warn others, and attempt to stop the release at the source, if it can be done safely;
- If it is not possible to stop the release, evacuate the area;
- Notify supervision;
- Call 2911 and report the release;
- Isolate the area to prevent traffic through the release; and
- Minimize personnel exposure to the hazards.

Occurrence reporting requirements per ADM 16.01 and DOE Order 5000.3 states that DOE and DOE contractor line management will be kept fully and currently informed of all events which could:

- Affect the health and safety of the public;
- Seriously impact the intended purpose of DOE facilities;
- Have a noticeable adverse effect on the environment;
- Endanger the health and safety of workers; or
- Adversely affect the national security or the security interests of DOE.

If any of the above incidents occur, personnel should notify supervision, fire and emergency at extension 2911, and the shift superintendent at extension 2914. Personnel will report their name, organization, phone or radio number, location of occurrence, time of event, and the nature and seriousness of the event per procedure ADM 16.01 and COOP-015 (Appendix A). Table 8.1 presents a list of emergency contacts.

INSERT Table 8-1 Trench 1 Project Personnel Phone List HERE

9.0 WASTE MANAGEMENT

Several different waste streams will be generated during this project. The waste streams identified may include the following:

- Debris (e.g. drum carcasses, wood, paper, filters)
- Stabilized depleted uranium chips
- Miscellaneous liquid waste (i.e. still bottoms)
- Used PPE
- Used HEPA filters
- Decontamination waste water and remediation waste waters
- Contaminated soil
- Sanitary waste
- Other miscellaneous hazardous waste (i.e. cemented cyanide)

9.1 DEBRIS

Debris may include, crushed drums, broken pallets, trash, miscellaneous treatment debris, and any unexpected debris encountered during excavation. Unexpected debris will be addressed per the HASP (RMRS, 1997c) and as described in Appendix H.

Following excavation, debris may be segregated into one of four categories:

Uncontaminated debris, WFC1326

VOC-contaminated debris, WFC1325

Low-level contaminated debris, IDC326

VOC and low-level contaminated debris, IDC325

Debris contaminated with VOCs, or debris in which a representative sample could not be collected to assure the debris is VOC-free, may be processed in a TDU. Debris that the field supervisor expects to be free of significant VOC contamination will be evaluated as follows:

- Determine if organic vapors can be detected above five ppm using field screening monitoring equipment
- Determine if there is visible evidence of contaminant staining
- Using the field supervisor's professional judgement, considering process knowledge, that the debris in question is contaminated with VOCs, to collect samples for VOC analysis, or
- Using the field supervisor's professional judgement; considering process knowledge, that the debris in question is free of VOCs

After evaluating the criteria stated above, the field supervisor will request assistance from Radiological Engineering and Radiation Safety to evaluate the debris for radiological contaminants above background. Radiological contaminated debris will be segregated, characterized and containerized per all applicable Solid Radioactive Waste Packaging requirements. The containers for debris waste will be located in a Contaminated Area near Trench 1.

PCE or TCE at detectable levels will require field personnel to conclude that the debris "contains" F001 and will be characterized and managed appropriately within a temporary unit (TU). Following evaluation of debris samples, the debris will be packaged according to its most likely disposal location (Envirocare of Utah, Inc. or Nevada Test Site) or staged for thermal desorption treatment, if needed. For debris uncontaminated with VOCs and radiological contaminants, the debris will be sent to the appropriate off-site sanitary landfill. Placing non-hazardous, non-radioactive debris into dump trucks for off-site sanitary landfill disposal may be performed by the heavy equipment operators at the direction of the Field Supervisor. Size reduction may be performed as required within the containment structure with equipment such as a portable hydraulic drum crusher with personnel trained to perform that function. Packaging of debris into roll-offs, waste crates, or drums will be performed by qualified personnel. The waste generator will be responsible for insuring that the waste containers are properly filled, labeled, and have the waste residue traveler documentation in accordance with procedures.

The project decontamination pad, or the Main Decontamination Facility may be configured to perform low-level, hazardous or mixed waste debris treatment. Treatment may include high pressure steam, water sprays, and water washing. Following treatment, as long as the debris does not exhibit a hazardous waste characteristic, the debris will no longer contain a listed hazardous waste and will no longer be subject to RCRA hazardous waste requirements. Solid residues from the treatment of debris containing hazardous wastes will be collected and managed in accordance with RCRA hazardous waste management ARARs. Any solid residues from debris treatment that exhibit a hazardous waste characteristic will also be managed in accordance with RCRA hazardous waste management requirements. Liquid residues from the treatment of debris containing listed hazardous wastes are subject to RCRA hazardous waste management ARARs until they are transferred for treatment in the CWTF. Any CWTF residues that result from the treatment of listed debris will carry the same listing as the listed debris from which it originated. Any CWTF residues that exhibit a hazardous waste characteristic will also be managed in accordance with RCRA hazardous waste management ARARs.

9.2 STABILIZED DEPLETED URANIUM

Stabilized depleted uranium chips and associated soils will be packaged and treated to meet the waste acceptance criteria (WAC) of the receiving disposal facility, and will be stored onsite pending final off-site disposition at either a low-level or low-level mixed waste disposal facility. Operational waste associated with the stabilization process will be screened for radiological contamination. If this waste is not radioactive or RCRA hazardous it will be placed in an off-site sanitary waste landfill.

The depleted uranium chips will be stabilized using a stabilizing agent in an approved waste container (metal crate, roll-off, etc.). Due to the many conditions that may exist at the Trench 1, as described in Section 7.3, waste treatment may use two approaches and therefore yield separate stabilized waste forms. Regardless of which treatment approach is utilized, the mixed batch of material and stabilization agent will be sampled to ensure compliance with the accepting disposal facilities WAC. Packaging of treated waste generated during treatment activities will be performed by a qualified waste generator. Once the batch has cured in the container, the container will be transferred to the Radiological Material Area near Trench 1. If the waste is stored outside for more than 60 days, a formal designation storage area will be approved by the Site Radiation Group and monthly inspections will be performed according to the RFETS Radiation Control Procedure. If the stabilized monolith waste contains a listed waste, it will be stored within a TU and assigned the corresponding waste code.

9.3 MISCELLANEOUS LIQUID/SLUDGE WASTE

Liquid waste and decontamination or incidental water stored in temporary containers (e.g., tanks, drums) will be managed according to the substantive container management requirements found in Section 5.2.6 of the PAM (RMRS, 1997a) and listed below.

- All containers will be in good condition, will be compatible with the waste being stored, and will remain closed except when adding or removing waste.
- All full containers storing liquids will be used in conjunction with an appropriate secondary containment system. Where practical, the containers (e.g., 55-gallon drums) will be elevated from the base of the secondary containment or the base of the secondary containment must be sloped so that accumulated incidental liquids (i.e., rain) are not in contact with the waste, and can be removed.
- The containment system must have sufficient capacity to contain 10 percent of the total volume of containers or the volume of the largest container, whichever is greater. Spilled or leaked waste must be removed in a timely manner as necessary to prevent overflow of the containment system.

Liquids such as still bottoms and sludges, if encountered, will be segregated and managed appropriately. The containers will be inspected for labels, markings, or other information which may indicate its contents. The liquids/sludge will be screened for radiological and volatile organic contamination and will be repackaged to ensure container integrity. After container integrity is assured, the liquids may be stored in a TU and within secondary containment. Liquids/sludge will be sampled to make a waste determination and characterization.

Any spills or serious incidents relating to the liquid waste streams will include immediate notification of the following personnel and the shift superintendent (extension 2914 or radio 3310):

Mark Burmeister, T-1 Site Project Manager
Office: 966-5891
Pager: 966-4000 pager number 4630
[redacted]

Gary Konwinski, RMRS Environmental Program Manager
Office: 966-2729
Pager: 966-4000 pager number 6139

Marla Broussard, Environmental Restoration Operations Manager
Office: 966-6007
Pager: 966-4000 pager number 4010
[redacted]

9.4 PERSONAL PROTECTIVE EQUIPMENT

Secondary wastes such as PPE, will be characterized based on process knowledge and radiological screening. PPE identified as non-radiological and non-hazardous will be disposed of in an off-site sanitary waste landfill. PPE identified as hazardous or low level/low level mixed will be stored in appropriate containers on-site pending shipment to an approved disposal facility. PPE will be packaged and managed in accordance with RFETS procedures (see Section 9.1) by waste generator qualified personnel.

9.5 USED FILTERS

Used HEPA filters will be generated during this remedial project. A NRWOL (1-I34-WO-1103-NRWOL) will be used and the waste will be packaged in the appropriate waste containers per RFETS procedures (see Section 9.1). HEPA filters will be screened and combined with the debris waste stream (if the same waste radiological/hazardous classifications apply).

9.6 DECONTAMINATION AND REMEDIATION WASTE WATER

Decontamination waste water generated at the site from decontamination activities (see Section 10.0) may be used for dust suppression on the radiologically and VOC contaminated soil. Decontamination water may be applied to soils in the CSS at the discretion of the RMRS Field Supervisor (when there are sufficient contaminated soils remaining in the CSS to absorb the water).

The use of decontamination water for dust control reduces the amount of clean water required for use in dust suppression activities and ultimately reduces the volume of waste water generated by the project. During rainy periods when additional water for dust suppression is not needed, the decontamination water will be temporarily stored for later use in dust control activities or will be transported to and treated at the CWTF. Decontamination water holding tanks will be labeled appropriately.

Remediation waste water generated during remediation will be transferred to the CWTF (Building 891) for treatment. If remediation waste water contains listed RCRA hazardous wastes or exhibits a RCRA characteristic, the RCRA hazardous waste codes would not be applicable or relevant and appropriate because the waste water is a CERCLA remediation waste being treated in a CERCLA treatment unit. The CWTF will treat remediation waste water to meet applicable surface water quality standards under a National Pollution Discharge Elimination System ARARs framework.

9.7 CONTAMINATED SOILS

Cleanup target levels used for the excavation activities are the RFCA Tier I soil action levels for radionuclides, cyanide, and VOCs, if encountered. Table 3-1 in the PAM lists the radionuclide, cyanide, and VOC cleanup target levels for excavation per RFCA. Uranium (U-238), cyanide, PCE, and TCE are the potential chemicals of concern for the project. If additional COCs are identified during the project, the action level for these contaminants will be designated as the Tier I subsurface soil action levels. Radiological monitoring of the soils will be performed for protection of the workers, the public, and the environment in accordance with 10 CFR 835 and the RFETS Radiological Controls Manual. Treatment of small amounts of soil associated with drum fragments and depleted uranium may be mixed with a stabilization agent. Once the batch has cured in the container, the container will be transferred to the Radiological Material Area near the Trench 1. Bulk associated radiologically contaminated soils above Tier I action levels will be excavated, treated if necessary, containerized, and staged for off-site disposal. If the waste soils are stored outside for more than 60 days, a formal designation storage area will be approved by the Site Radiation Group, additionally, monthly inspections will be performed according to the Site Radiation Control Procedure. PCE or TCE at detectable levels will require field personnel to conclude that the soil "contains" F001 and will be characterized and managed appropriately within the CSS. The CSS will also be subject to the general RCRA requirements identified in Table 5-1 of the PAM.

9.8 SANITARY WASTE

All sanitary wastes will be managed in accordance with the RFETS Sanitary Waste Off-Site Disposal Manual, 1-MAN-011-SWODM and the Sanitary Waste Off-Site Procedures, 1-PRO-573-SWODP.

9.9 MISCELLANEOUS HAZARDOUS WASTE

Historical information indicates other wastes are buried in T-1 from Building 444 including 10 drums of cemented cyanide and "copper alloy." Cemented cyanide wastes will be re-packaged and sampled in accordance with the SAP. For reactive cyanide waste, treatment to the Land Disposal Restrictions levels for waste or non-waste water is required. D003 reactives are not subject to evaluation of underlying hazardous constituents. Sampling results will be used to verify the material waste type, characterize the waste for applicable storage, disposal, and treatment options (if required), and/or resolve whether the present waste form is acceptable for disposal. The re-packaged waste material will be stored in a Temporary Unit (TU) established for storage of wastes during this project. Artifacts suspected as being "classified" items will be immediately isolated in accordance with Appendix G, "Discovery of Classified Material/Artifacts Instructions." Unexpected waste is an unexpected hazard or condition and will be addressed per the HASP (RMRS, 1997c) and as described in Appendix H.

10.0 DECONTAMINATION

Decontamination activities will be performed as described in the site specific HASP (RMRS, 1997c). Personnel will be decontaminated within the CRZ at the stepoff pad access/egress points designated for the excavation area, temporary containment structure, and soil stockpile area. Heavy equipment and all support equipment will have gross decontamination performed in the EZ at a mobile decontamination site before being moved to the main decontamination facility. Equipment will be inspected and radiologically surveyed before access to the project site. Radiological surveys will be performed before equipment is released from the EZ and RFETS per the RFETS Radiological Operating Instructions. Debris decontamination may be performed in the field or at the main decontamination facility if practical. In addition, decontamination will be performed in accordance with operating procedures FO.03, Field Decontamination Operations, FO.04, Decontamination of Equipment at Decontamination Facilities, FO.06, Handling of Personal Protective Equipment, and FO.12, Decontamination Facility Operations.

11.0 GENERAL INSPECTION REQUIREMENTS

General inspections of the T-1 Operations and Temporary Units will be performed. The T-1 Operations and Temporary Units will be inspected for possible malfunctions and deterioration, operator errors, and discharges that may cause or may lead to the release of hazardous waste constituents to the environment or a threat to human health. The inspections will be conducted daily during regular operating hours to attempt to identify and correct potential problems in time before they pose a threat to human health and the environment. A log book will be used for inspecting monitoring equipment, safety and emergency equipment, operating and structural equipment (such as dikes and sump pumps) that are important to preventing, detecting, or responding to environmental or human health hazards. A weekly inspection log form will be used for inspecting the Temporary Units. At a minimum, these records will include the date and time of the inspection, the name of the inspector, a notation of the observation made, and the date and nature of any repairs or other remedial actions.

12.0 REFERENCES

Department of Energy (DOE), Order 5400.3

Department of Energy (DOE), Order 5480.19

Department of Energy (DOE), 1996, Rocky Flats Cleanup Agreement, Rocky Flats Environmental Technology Site, Golden, Colorado.

Kaiser Hill Company, L.L.C., 1996, Rocky Flats Environmental Technology Site Radiological Controls Manual, Rocky Flats Environmental Technology Site, Golden, Colorado.

Kaiser Hill Company, L.L.C., 1997, Trench 1 Source Removal Air Monitoring Plan, Rocky Flats Environmental Technology Site, Golden, Colorado, July.

RMRS, 1997a, Proposed Action Memorandum for the Source Removal at Trench 1, IHSS 108, Rocky Flats Environmental Technology Site, Golden, Colorado, RF/RMRS-97-011, July 23, 1997.

RMRS, 1997b, Sampling Analysis Plan to Support the Source Removal at Trench 1, IHSS 108, Rocky Flats Environmental Technology Site, Golden, Colorado, July.

RMRS, 1997c, Site Specific Health and Safety Plan for the Source Removal at Trench 1, IHSS 108, Rocky Flats Environmental Technology Site, Golden, Colorado, RF/RMRS-97-010, July.

RMRS, 1997d, Field Implementation Plan for the Source Removal at the Mound Site, IHSS 113, Rocky Flats Environmental Technology Site, Golden, Colorado, July.

Appendix A

Conduct of Operations
Implementation of COOP for Trench 1

CONDUCT OF OPERATIONS (COOP)

Implementation of COOP for Trench 1
May 1997

1-31000-COOP-001 CONDUCT OF OPERATIONS

Purpose: Provides requirements, guidelines, and instructions to ensure that operations and support activities are conducted in a manner consistent with RFETS goals, objectives, and approved procedures in accordance with DOE Order 5480.19.

COOP-001 is implemented as described below for each of the subsections.

1-31000-COOP-002 INTERNAL SURVEILLANCE PROGRAM

Purpose: Describes the process for conducting management internal surveillance of activities to help ensure operations are safely and efficiently performed.

Personnel from quality assurance will perform internal surveillance's of field activities conducted by RMRS and subcontractor personnel.

1-31000-COOP-003 CONTROL OF ON-SHIFT TRAINING

Purpose: Establishes the necessary on-shift evaluation and qualification training requirements for all on-shift instructors and operations and support personnel.

Project personnel comply with COOP-003 with all onsite training requirements and 3-day OJT for hazardous waste operations. Subcontractors will also comply with COOP-003 with their project-specific training performed onsite and the 3-day OJT for hazardous waste operations

1-31000-COOP-004 VITAL SAFETY SYSTEMS OPERATIONAL STATUS

This procedure is applicable to RFETS nuclear facility buildings and is not applicable to Trench 1 (hereafter referred to as Trench 1) as the project does not utilize VSS .

1-U70-COOP-005 AUTHORIZATION BASIS TRACKING AND DOCUMENTATION

Purpose: Describes the process for tracking and documenting Limiting Conditions for Operation (LCO) surveillance's and Operational Safety Requirements (OSRs) compliance-related compensatory measures associated with Unreviewed Safety Question Determinations (USQDs), Engineering Operability Evaluations (EOEs), and Justifications for Continued Operations (JCOs).

An Auditable Safety Analysis was prepared for Trench 1 which classified the project as a "radiological" facility. The Auditable Safety Analysis was reviewed and approved by the RMRS Operational Review Committee, therefore this procedure is not applicable.

1-31000-COOP-006 OPERATING AREA AND LOGS

Purpose: Defines the process for identifying and controlling operating logs and other records to ensure maintenance of complete and accurate operational histories. Environmental Restoration Management systems which do not affect, connect to, or interface with plant systems or utilities and which are owned and being operated by subcontractors, are exempt from this procedure.

Treatment- The treatment system is connected to plant power, therefore COOP-006 is applicable during treatment operations. As part of the treatment process, the subcontractor will maintain logs per this procedure and COOP-012, Shift Operating Rounds. RMRS will also maintain controlled logbooks per 2-S47-ER-ADM-05.14, Use of Field Logbooks and Forms, to document field activities during the implementation of Trench 1.

1-31000-COOP-007 SHIFT RELIEF AND TURNOVER

Purpose: Describes requirements, guidelines, and actions to be taken during shift relief and turnover to ensure effective communication of system and process operating parameters, routine, and scheduled shift activities, and unusual or off-normal conditions.

This procedure is applicable during operation of the treatment system which will be operated 24 hours per day, five days per week. Shift relief and turnover and staff changeovers will be conducted by RMRS and subcontractor personnel in accordance with COOP-007.

1-31000-COOP-008 CONTROL OF CAUTION TAGS
Purpose: Describes the process for controlling Caution Tags to continue operating equipment and facilities when situations arise that require special temporary cautionary measures.

This procedure applies to treatment operations and the Field Supervisor will defer to the Lockout/Tagout manager for either a Caution Tag or Lockout/Tagout of the affected equipment. Lockout/Tagout of affected equipment will be performed in accordance with HSP 2.08.

1-31000-COOP-009 CONTROL OF INFORMATION TAGS - CANCELED

1-31000-COOP-010 CONTROL OF OPERATOR AIDS
Purpose: Defines the process for controlling operator aid postings and information tags for the safe operation of RFETS.

This procedure is applicable and Trench 1 project management personnel will control and post operator aids for the following equipment.
Excavation-
Post procedure for air trailer operation and MSA ultralight quick connect system.
Treatment-
Post procedure for operation of condensate transfer to condensate storage tanks, operation of condensate tanks, and transfer of condensate to tanker truck.
Post procedure for operation of low temperature thermal desorption units.
Post procedure for operation of propane vaporizer, shut down and start up, and propane line emergency shutoff valves.

1-31000-COOP-011 PRE-EVOLUTION BRIEFING
Purpose: Describes the process for preparing, scheduling, and conducting Pre-Evolution Briefings (PEBs) to identify and address Conduct of Evolution to mitigate potential impacts to the public health, safety, or the environment resulting from a scheduled evolution.

This procedure is applicable to all phases of Trench 1. A PEB is given to all team members prior to each task. Trench 1 will have a PEB prior to the site preparation, excavation, treatment, and site reclamation tasks and when there are changes in scope of a task or for new personnel.

1-31000-COOP-012 SHIFT OPERATING ROUNDS
Purpose: Provides instructions for performing operator rounds to monitor and record system and process parameters for each operating shift. Requires operations personnel to tour operations once per shift. Used to identify and correct undesirable trends and equipment problems and to facilitate turnover of equipment status (COOP-007).

This procedure is applicable and Trench 1 treatment subcontractor personnel will use round sheets or controlled logs to collect specific data, record equipment status, note unusual conditions, and plot performance trends. Log sheets will be used to record oven start time, oven temperature, stop times, pressure differentials, vacuum readings, stack FID readings, and other equipment monitoring data recorded during treatment. Inspection tours will be performed to verify system performance, standby equipment is operational, and equipment alarms are functional.

1-G58-COOP-013 STANDING, SHIFT, AND OPERATIONS ORDERS
Purpose: Provides procedures for development, approval, distribution, revision, cancellation, and maintenance of Standing, Shift, and Operations Orders.

This Order appears to be programmatic and Trench 1 site personnel will comply with any Standing, Shift, and/or Operations Orders which apply to project operations.

1-31000-COOP-014 INDEPENDENT VERIFICATION

Purpose: Describes administrative controls to perform Independent Verification (IV) for components and system alignment. Required for valves, breakers, and other components in any system that provide life support (for example, breathing air) to personnel. Required for valves, breakers, and other components in any system that could result in a release of hazardous materials or energy where personnel and environmental safety is concerned.

This procedure is not applicable to the breathing air system used during the Trench 1 project will be conducted in an open air environment which allows ready access to the air supply trailer and to emergency egress, as required. The breathing air system is a portable cascade breathing air system where an air trailer and air trailer operator are at the immediate area of breathing air use. The air trailer operator maintains surveillance of personnel using supplied air at all times. Ground personnel will utilize MSA ultralight quickfill, SCBA air equipment which is refilled by the individual ground personnel during use. The air trailer operator maintains eye contact with the ground personnel during refilling of the quickfill SCBA. The heavy equipment operators are provided breathing air from two 3400 psi air bottles mounted on each of the equipment. Each piece of air equipment is equipped with alarm bells when air supply is low and an emergency egress air supply. Air gauges and air equipment are examined and performance checked at the beginning of each shift. Air tanks will be refilled as necessary. Air trailers are exchanged out with new refilled air trailers as needed. Project personnel are trained in the use of the air equipment prior to initiating work. Grade D certified breathing air is supplied by a qualified vendor. Personnel are instructed how to perform emergency egress if their breathing air equipment fails as part of the site-specific breathing air training.

This procedure is not applicable to the propane line or condensate lines which could result in a release of hazardous materials because the propane line and condensate transfer lines are temporary, installed in an open visually observable environment, and inspected daily by industrial hygienists with an explosimeter. The propane line will be checked by Facility Inspection after installation, pressure gauges are checked frequently during operations, and the line will be shutoff when not in operation. Condensate transfer lines, valves, and connections are visually observed by the operator during transfer of condensate.

1-31000-COOP-015 COMMUNICATIONS CRITERIA

Purpose: Defines the communication criteria required to ensure a complete and consistent exchange of information or instruction.

Applicable to all phases of the project. Ensures communications contain information or directions necessary to successfully achieve the desired result. Give directions that are explicit, understandable, and include: who is giving the direction; who is to perform the action; what is to be done and why; when it is to be done; what procedure, if applicable; and additional communication required (when to report the task is completed). Minimize multiple actions in verbal instructions, write down multiple actions or give several short verbal instructions after each task is completed. When verbally receiving data, write down the information and do not rely on memory. The recipient acknowledges all communications by repeating back the communication as necessary to ensure the originator's communication is understood. Reporting emergencies per procedures (HASP, FIP), and conduct communications so as to not interfere with timely mitigation of the emergency. Procedure details written, verbal, and hand signal and gestures to be used. Addresses telephone and two-way radio communication procedures. Describes use of the LS/DW System. RMRS will, in addition to conducting communication in accordance with COOP-015, utilize an equipment status board and document shift relief and turnover per COOP-007, and maintain field logbooks and forms per COOP-006.

1-31000-COOP-016 PLAN OF THE DAY

Purpose: Provides requirements, guidelines, and instruction associated with the Plan of the Day (POD) process used to control operations and maintenance activities at RFETS.

This procedure is applicable to all phases of Trench 1. Project personnel schedule field work on the Environmental Restoration Plan of the Week each week. During field work, a plan-of-the-day/tool box meeting is conducted each day by the field supervisor, covering lessons learned from the work completed the previous day and the scope of the work to be performed that day, and the industrial hygienist, covering the hazards and hazard mitigation which are summarized on the task-specific AHAs. Team members are requested to provide input into the plan of the day and

reminded that safety is first. Safety begins with each individual who by looking after themselves can better protect their coworkers. Project staff encourage subcontractors to be proactive in their own safety program and challenge them to respond accordingly. A recent example is the Responsible Individual (RI) program in which a subcontractor worker is identified as an RI at the morning plan-of-the-day/tool box meeting. The RI is asked to observe work during the day for safety problems or hazards. The RI is then asked to report about what in general they observed and then the RI is asked to talk about another safety topic at the next mornings meeting.

1-31000-COOP-017 CONTROLLED DEACTIVATION OF ALARMS
Purpose: Describes actions to be taken for deactivation and reactivation of all alarms affecting safety at RFETS and to ensure compliance with applicable Operational Safety Requirements (OSRs) and Limiting Conditions for Operations (LCOs).

Trench 1 will not be utilizing an alarm system which is applicable to OSRs or LCOs.

1-31000-COOP-018 VITAL SAFETY SYSTEM STATUS CONTROL
Purpose: Provides requirements, guidelines, and instructions for managing the status of a Vital Safety System (VSS) at RFETS.

This procedure is not applicable to Trench 1 because the project does not utilize VSS operating status control or uses a component of a VSS.

1-31000-COOP-019 RETURNING SYSTEMS AND EQUIPMENT TO SERVICE
Procedure is canceled and incorporated into COOP-001

1-31000-COOP-020 TERMINATION OF OPERATIONS PROCESS
Purpose: Provides instructions for determining the necessary scope of termination of operations, implementing the defined scope of termination of operations, and processing a Justification for Continued Operation (JCO). Required by the OSRs for termination of operations, for both resumption and nonresumption facilities.

Trench 1 is classified as a "radiological" facility based on the Auditable Safety Analysis Report (dated April 23, 1997). However, because Trench 1 is not considered an operating facility with engineered safety controls in place as the result of a safety analysis, this procedure does not apply.

1-31000-COOP-021 OPERABILITY DETERMINATION PROCESS
Purpose: Provides instructions for all necessary reporting, communication, and control activities from the time a VSS deficiency is identified until an operability determination has been made.

This procedure is not applicable to Trench 1 as the procedure is a requirement of DOE Order 5480.5, Safety of Nuclear Facilities, and the project is classified as a "radiological" facility hazard classification. However, there will be a specific step in the Integrated Work Control Package for Treatment which will require signature approval by the project manager for the treatment vendor to proceed with the treatment process based on meeting the baseline conditions during shakedown per the project's Sampling Analysis Plan.

1-31000-COOP-022 INACTIVATION OF EQUIPMENT AND AREAS
Procedure is canceled

Appendix B

Trench 1 Authorization for Soil Disturbance

Appendix C

Trench 1 ALARA Job Review

Appendix D

Trench 1 Forms and Checklists

Trench 1
Shift Relief and Turnover
Date:
Shift:

Equipment/Systems Status Board and Maintenance

Lock out/Tag out Y/N

Treatment Summary - Oven Status

OVEN	RUN	BATCH	COMMENTS
1			
2			
3			
4			

Status from Previous Shift

Unusual or Off Normal Events

Incidental Spills: Y/N

Injuries/Accidents: Y/N

Radiological Concerns: Y/N

Rad Eng:

Hazardous Waste: Y/N

Plan of the Day

Shift Relief/Turnover Acceptance:

Offgoing Field Supervisor

Ongoing Field Supervisor

ConCover Certification Evaluation

This evaluation is graded on a scale of 1 to 5, with one being a low score and five being a high score. In order to become certified to use ConCover, the persons being evaluated must obtain at least a four on each item in the evaluation.

Application Equipment

Safety

_____ Is familiar with the operators manual.

_____ Identifies and understands all caution stickers on machine.

_____ Worked on and around the machine in a safe manner.

_____ Wore a dust mask and goggles when loading ConCover® into the machine.

_____ Site workers understand that the tank of the CAPS machine is classified by the OSHA Confined Space Standard CFR 1910.146 as a confined space and know not to enter without following an established confined space entry procedure provided by their safety personnel.

Engine start-up

_____ Checked oil

_____ Serviced grease fittings as required

_____ Had recirculation valve opened

_____ Had discharge valve closed

_____ Had clutch disengaged

_____ Had agitator control in the neutral position

_____ Started engine

Demonstrated proper lever and valve settings

_____ Engaged agitation system forward/reverse.

_____ Cannon On/Off

_____ Recirculation On/Off

_____ Hose On/Off

_____ Controlling hose pressure using recirculation / throttle.

_____ Filled tank with the correct amount of water using tank measurement as well as gallon / liter chart and tape measure.

_____ Determined the proper amount of ConCover 180™ to be added to the water as 6 "A" bag and 2 "B" bag per every 100 (379 liters) gallons of water.

_____ While adding the "A" bags the product was recirculating through the pump.

_____ When adding the "B" bags the recirculation was turned off.

_____ Demonstrated the proper speed setting for the agitation system during mixing.

_____ Added ConCover A and B bags at an acceptable rate.

_____ Correctly foamed the product See equipment use section, foam generator.

Mixing and measuring ReJeXit™

_____ Using the provided water chart an a measuring device, filled tank with correct amount of water.

_____ Determined the correct amount of materials to add to tank.

_____ Added ReJeXit materials to tank at an acceptable rate.

_____ Mixed the batch for ten minuets prior to application.

Application / Record Keeping

Application

_____ Operator verbally explained an acceptable method for this application.

_____ Operator demonstrated the proper spraying technique of allowing the material to rain down on to waste face as opposed to spraying directly into the waste.

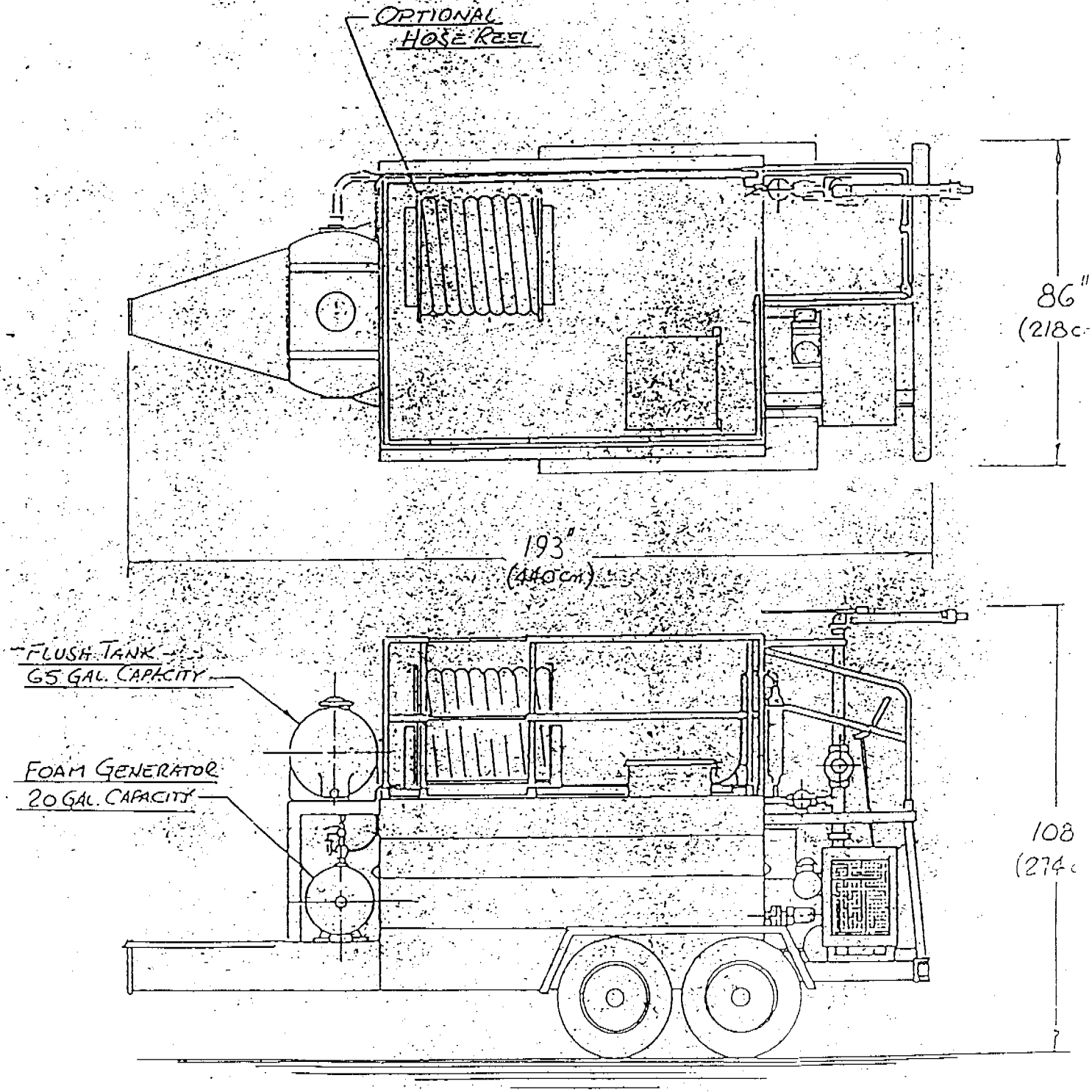
_____ Operator sprayed ConCover® from enough angles to achieve a total cover of the the waste face.

Record Keeping

_____ Operator properly filled out record keeping form.

_____ _____

Sign, Date, Operator Sign, Date, Instructor



CAPS 900 - "180" SPRAYER

MATERIAL SAFETY DATA SHEET

Trade Name: ConCover® Remediation "A" Bag

Section I **General Information**

Item Name: Earthen material blend/natural cellulosic polymer
Final product is a fibrous slurry
Classification # 2508 10 0000

Manufacturer: New Waste Concepts
7401 Fremont Pike
Perrysburg, Ohio 43551
(419) 872-8160

Date MSDS Prepared: February 6, 1996
Last Review Date: February 6, 1996
MSDS Preparers Name/Address: Prepared by manufacturer.

Unit of Issue/Container Type: Tote sacks or reinforced paper bags, various weights.

Product Description: Binding material blended with natural earthen materials; biodegradable organic compounds with other inert material and fibrous, cellulose based materials. Respirable dusts are present.

Section II **Ingredient/Identity Information**

Proprietary (Y/N): Y

Ingredient	Composition (%)	CAS #	Exposure Limits (TWA)
silica crystalline quartz	2-6 (<2 respirable)	14808-60-7	2.5 mg/m³ (OSHA PEL)
non-toxic respirable dust	n/a	n/a	15 mg/m3 (OSHA PEL) 10 mg/m3 (ACGIH TLV) 5 mg/m3 (resp frcn, OSHA)

Section III **Physical/Chemical Characteristics**

Appearance and Odor: Greyish/white fine powder with no distinctive odor.

Boiling Point: n/a
Melting Point: n/a
Vapor Pressure: n/a
Vapor Density: n/a
Specific Gravity: n/a
Decomposition Temperature: n/a
Evaporation Rate: n/a
Solubility (H_2O): n/a
Percent Volatiles by Volume: 0
Viscosity: n/a
pH: n/a

Radioactive (Y/N): N
Ferromagnetic (Y/N): N

Section IV Fire and Explosion Hazard Data

Flash Point: n/a
Lower Explosive Limit: n/a
Upper Explosive Limit: n/a
Extinguishing Media/Methods: Use dry chemical, CO_2, AFFF (foam), or water.
Special Fire Fighting Precautions: None
Unusual Fire/Explosive Hazards: Suspended dust/air mixture may ignite if concentrated and in the presence of ignition source. Do not mix product in an enclosed environment.

Section V Reactivity Data

Stable (Y/N): Y
Conditions to Avoid: No off gassing produced when mixing with water.
Materials to Avoid: Do not mix or store with strong bases (e.g. hydroxides). Keep away from oxidizers.
Hazardous Decomposition Products: Upon decomposition, may emit fumes of SO_x.

Section VI Health Hazard Data

Routes of Entry
- Inhalation (Y/N): Y
- Skin (Y/N): N
- Ingestion (Y/N): N
- Other: N

Contact Eye/Skin Hazards: Y, Dust may cause eye irritation.
Acute Overexposure Symptoms: Acute inhalation may produce lung, nose, and throat irritation. Systemic symptoms may include dyspnea and liver effects.
Chronic Overexposure Symptoms: Inhalation of dust over time may cause delayed pulmonary fibrosis disease.
Carcinogenicity Data: Silica dust is an experimental carcinogen and tumerogen (Dangerous Properties of Industrial Materials, Sax/Lewis, 7th ed.). Limited evidence of carcinogenic effects of crystalline silica in humans (IARC Monographs on the Evaluation of the Carcinogenic Risks of Chemicals to Humans, vol. 42, 1987).
Emergency Treatment/ First Aid Procedures: Gross Inhalation - Move victim to fresh air environment. Seek immediate medical attention.
Gross Ingestion - No oral toxicity known. May cause intestinal blockage.
Skin Contact - Wash affected areas with soap and water.
Severe Eye Contact - Flush eyes with water for 15 minutes. Seek medical attention.

Section VII Precautions for Safe Handling and Use

Personal Protective Equipment (Routine Use):

Respiratory Protection: Respirators are not required when using this product under routine outdoor conditions. In cases when excessive dusts might be periodically created, use NIOSH/MSHA approved full or half face respirators with dust cartridges when pouring and mixing product.

Gloves: Recommend latex, butyl rubber, or nitrile gloves.

Eye Protection: Safety goggles or glasses recommended.

Other: Recommend Tyvek suits or coveralls.

Work Practices:	This product is to be used in outdoor environments. Exposures to hazardous components are not expected to exceed permissible limits during routine daily use. Minimize dusting whenever possible. Do not use this product in confined or enclosed environments. Do not use in the presence of flames or sparks.
Ventilation:	If routine indoor use is required, or in the presence of excess dust generation, local exhaust ventilation is recommended.
Spill/Release Procedures:	Excess spilled product, if uncontaminated, may be cleaned and disposed of as ordinary waste. No special clean up procedures are recommended.
Neutralization Procedures:	n/a
Waste Disposal Procedures:	This material is not a listed hazardous waste, nor does it exhibit any hazardous waste characteristic.
Storage/Handling Procedures:	Store product in a dry environment, away from strong bases and oxidizers.
Other Health Hazard Precautions:	Use proper lifting procedures when attempting to dispense product from 50 lb. bags.

Reviewed and Approved/Date 2/9/96

Thomas J. Nachtman
President

MATERIAL SAFETY DATA SHEET

Trade Name: ConCover® "B" Bag

Section I General Information

Item Name:	Recycled paper and fiber
Manufacturer:	New Waste Concepts, Inc. 7401 Fremont Pike, Suite 10 Perrysburg, OH 43551 (419) 872-8160
Date MSDS Prepared:	August 16, 1995
Last Review Date:	August 16, 1995
Msds Preparers Name/Address:	prepared by manufacturer.
Unit of Issue/Container Type:	Reinforced paper bags, 35 lbs.
Product Description:	Recycled cellulose
Multiple Part Product (Y/N):	Y
Description of Related Components:	ConCover® "A" Bag

Section II Ingredient/Identity Information

Proprietary (Y/N): Y

Section III Physical/Chemical Characteristics

Appearance and Odor:	Fiberous with brown or natural green color
Boiling Point:	N/A
Melting Point:	N/A
Vapor Pressure:	N/A
Vapor Density:	N/A
Specific Gravity:	N/A
Decompositon Temperature:	N/A
Evaporation Rate:	N/A
Solubility (H20):	Slightly Soluble
Percent Volatiles by Volume:	N/A
Viscosity:	N/A
pH:	N/A
Radioactive (Y/N):	N
Ferromagnetic (Y/N):	N

Section IV Fire and Explosion Hazard Data

Flash Point:	N/A
Lower Explosive Limit:	N/A
Upper Explosive Limit:	N/A
Extinguishing Media/Methods:	Use CO2, dry chemical foam, or water
Special Fire Fighting Methods:	None
Unusual Fire/Explosive Hazards:	Keep away from strong basic materials such as sodium, potassium hydroxides. Keep away from oxidizers.

Section V Reactivity Data

Stable (Y/N):	Y
Conditions to Avoid:	Heat, fire, water.
Materials to Avoid:	Keep away from oxidizers and strong basics.
Hazardous Decomposition Products:	CO2, CO3

Section VI Health Hazard Data

Routes of Entry

Inhalation (Y/N):	Y
Skin (Y/N):	N
Ingestion (Y/N)	N
Other:	N

Contact Eye/Skin Hazards:	N/A
Acute Overexposure Symptoms:	Avoid prolonged inhalation of fiber material.
Chronic Overexposure Symptoms:	

Emergency Treatment/ First Aid Procedures:

Gross Inhalation:	Move victim to fresh air environment. Seek medical attention.
Gross Ingestion:	No oral toxicity known.
Skin Contact:	Wash affected areas with soap and water.
Severe Eye Contact:	Flush eyes with water for 15 minutes. Seek medical attention.

Section VII Precautions for safe Handling and Use

Personal Protective Equipment (Rountine Use):

Respiratory Protection:	Face shield recommended but not required.
Gloves:	Recommend latex, butyl rubber, or nitrile gloves.
Eye Protection:	Safety goggles or glasses recommended.
Other:	None
Work Practices:	This product is to be used in outdoor environments. Do not use in the presence of ignition sources.
Ventilation:	Use outdoors
Spill/Release Procedures:	Sweep material into drums and dispose of in accordance to local, state, and federal laws. Does not need to be reported to CERCLA or RCHA.
Neutralization Procedures:	N/A

Waste Disposal Procedures:	This material is not hazardous, nor does it exhibit any hazardous waste characteristic.
Storage/Handling Procedures:	Store product in a dry environment, away from strong bases and oxidizers.
Other Health Hazard Precautions:	Use proper lifting procedures when attempting to dispense product from 35 lb. bags.

Reviewed and Approved/Date:

Thomas J. Nachtman
President

Appendix F

Site Reclamation - Reseeding Guidance and Specifications

REVEGETATION INSTRUCTIONS FOR MOUND/TRENCHES PROJECT

Several DOE Orders (4300.1B, 6430.1A, 5400.1) require the stripping and stockpiling of topsoil from work areas prior to the start of construction work and revegetation with native plant species at the end of the work. Topsoil is to be stripped to a minimum depth of 8 to 10 inches to ensure that sufficient soil is stockpiled for subsequent revegetation efforts. Topsoil stockpliles are to be placed such that erosion can be controlled. Surface waters must be protected from siltation from stockpiles and other disturbed areas in the event of runoff from precipitation. Additionally, soil stockpiles at the Site must be protected from wind-borne weed seed sources. This is best accomplished by covering the stockpile with a tarp for short-term storage, or planting temporary vegetation for longer-term storage. If a stockpile will remain unused for over a year, active weed control (i.e., herbicide application) will also be required. Weed exclusion is necessary to help in the sitewide noxious weed control effort. Should importation of topsoil from another location be necessary, every effort must be made to ensure that that location is weed-free to prevent importation of noxious weed seeds.

General revegetation directions for different revegetation needs at the Site have been developed by Site ecologists based on recent experience here. Customized seed mixtures for each site help ensure that appropriate species are planted, and that non-endemic species are not introduced. The current revegetation strategy is to restore the native prairie grasslands as closely as possible to preexisting conditions, rather than to change the character through reclamation and remediation. As exhibited by the "reclamation" acreage in the southeastern portion of the Site, planting aggressive non-endemic species at the Site can drastically change the native prairie. Even after two decades, the planted species have allowed little encroachment of native forbs and grasses into the "reclaimed" area.

Revegetation efforts have yielded mixed results for different revegetation efforts at the Site. Evaluation of the success of some early revegetation efforts has provided some useful information to help modify subsequent efforts. Substitution of hydromulch for soil is not a viable option. If no topsoil is available, topsoil must be procured from off-site to allow placement of a minimum of 6 to 8 inches of topsoil over the subsoil at the disturbance. Purchasing topsoil from off-site may be necessary for the mound project if insufficient topsoil is reserved.

Once a disturbance has been filled and re-contoured, the subsoil is to be ripped or scarified to a depth of 8 inches, to relieve soil compaction from heavy equipment, before topsoil placement. Topsoil must then be placed as evenly as possible in a 6- to 8-inch layer for imported soil, or as evenly as possible where native soil was reserved from the site. If reserved soil is used, all that is available must be applied. Care should be taken during topsoil application to avoid compaction of this layer.

The use of fertilizers for revegetation at the Site is not recommended. The plants in the recommended revegetation mixture are adapted to low nitrogen levels, and do better under these conditions. Additionally, the undesirable weed species are encouraged by fertilizers, and weed control costs can be reduced if fertilizers are unavailable to these species.

Subsequent to topsoil placement seed must then applied directly into the topsoil. Seeding may be performed using a no-till drill, or broadcast seeding, depending on slope, areal extent of the disturbance, soil conditions (much of the soil at the Site is too rocky for drill-seeding), and other site-specific factors. If the seed has been broadcast, the reseeded area is to be drag-chained or raked to ensure that the seed is buried prior to mulching.

Due to the large area and wind-exposure involved with the mound/trenches work areas, hydromulching is necessary for this location. Certified weed-free straw or hay mulch would not remain in place long enough to ensure revegetation success unless applied as a tackified hydromulch. Hydromulch must be applied as a separate, final step. Application of seed within the hydromulch is not an acceptable practice at the Site. While seed will sprout, the dry climate at the Site often causes the seedlings in hydromulch to desiccate and die before they can become established in the soil.

Only mulches bound by vegetable-based binders (tackifiers) are allowed for use on the Site, due to previous problems with petroleum-based binders leaching into the groundwater. Tackifying agents found to be "environmentally friendly" and chemically acceptable for use at the site are those based on guar gum, or Psyllium (alpha plantago). The product known by the brand name "SoilGuard" was also found to be chemically acceptable. Wood fiber or excelsior mulch material provides a good weed-free mulch fiber that can be combined with the tackifiers for good effect. Several products of this sort are available on the open market. Reprocessed newsprint-type wood fiber mulch has not yielded particularly good results at the Site, however, and its use is discouraged. The thick clumping and persistence of the papier-mache-like product may have inhibited good plant growth in one case.

Nylon netting has been prohibited for revegetation efforts at the Site. While the netting is an efficient means of stabilizing the mulch during the high winds often experienced at the Site, the clear evidence of songbird mortality caused by this netting has led Site ecologists to prohibit the use of netting. Killing songbirds is specifically prohibited by the Migratory Bird Treaty Act (MBTA), therefore, use of netting can cause a violation of this Act.

Experience has shown that hydromulching to a thickness of 1 to 1.5 inches is an optimum application rate. If mulch application is thinner, the likelihood of revegetation failure will increase. Limited or nonexistent success of a revegetation effort will require repeated attempts until successful revegetation is attained.

The project must plan to budget contingency funding to ensure available resources for additional revegetation efforts and weed control for a minimum of two years subsequent to the initial planting effort. This is necessary due to the arid climate, soil characteristics, and other factors at the Site. Adequate success cannot be assured with a single planting effort under the dry climate, unless irrigation can be ensured. Due to a growing noxious weed problem at the Site, all projects that cause surface soil disturbances must provide for weed control on these disturbances until the new vegetation is firmly established.

SEED MIXTURE FOR MOUND/TRENCHES REVEGETATION

Species[1]	Application Rate[2] (lbs/ac PLS)[3]
Big Bluestem (*Andropogon gerardii*)	3.0
Side-oats Grama (*Bouteloua curtipendula*)	2.0
Little Bluestem (*Schyzachrium scoparium*[4])	2.0
Blue Grama (*Bouteloua gracilils*)	2.0
Blue Flax (*Linum perenne*)	1.0
Blanketflower (*Gallardia aristata*)	0.5
Mountain Muhly (*Muhlenbergia montana*)	1.0
Gayfeather (*Liatris punctata*)	0.5
Western Wheatgrass (*Agropyron smithii*)	3.0
TOTAL	15

1) Local native varieties are to be used if available.
2) Application rate is for drill seeding. This rate should be doubled for broadcast seeding.
3) Pure Live Seed
4) Synonymous with *Andropogon scoparius*

Appendix G

Instructions for Discovery of Classified Artifacts

Instructions for Discovery of Classified Artifacts

1) Move people out of the immediate area.

2) Cover the material/artifact with a tarp or box.

3) Call the Occurrence Notification Center to call the on-call classifier at extension 3456.

4) Call dispatch at extension 2444 and tell them you have called a classifier.

5) If required, package according to Site procedure 4-D99-WO-1100, Solid Radioactive Waste Packaging.

Appendix H

Instructions for Discovery of Unknown Materials

Instructions for Discovery of Unknown Materials

1) Move people out of the immediate area.

2) Call the project manager Mark Burmeister DIGITAL PAGER 4630 or his designee.

3) Follow the OPS-DIR-001, Health and Safety Operations
   a) Pause to assess the potential hazard or condition.
   b) Evaluate the potential hazard or condition to determine the severity or significance of the hazard or condition and whether the controls the project has in place are sufficient to address the hazard or condition.
   c) Complete the evaluation and segregate the hazard or condition from the project activity if it can be done safely; or curtail operations to address the unexpected condition or hazard.
   d) Prior to restart fill out the attached Check List for Restart of Trench 1.

4) If required, package according to Site procedures.

Appendix I

Auditable Safety Analysis
for
Individual Hazardous Substance Site (IHSS) 108
Trench 1 (T-1) Source Removal Project

Appendix J

Trench 1 Source Removal Air Monitoring Plan

KAISER • HILL
COMPANY

Trench 1 Source Removal Air Monitoring Plan

July 1997

Rocky Flats Environmental Technology Site

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ABBREVIATIONS AND ACRONYMS

AQM	Air Quality Management
CFR	Code Of Federal Regulations
DOE	U.S. Department Of Energy
EDE	Effective dose equivalent
EPA	U.S. Environmental Protection Agency
FIDLER	Field instrument for the detection of low-energy radiation
mrem	Millirem
pCi/m^3	picoCuries per cubic meter
RAAMP	Radioactive Ambient Air Monitoring Program
S	Sampler
Site	Rocky Flats Environmental Technology Site
TBD	To be determined
T-1	Trench 1
µm	Micrometer

1.0 INTRODUCTION

This document outlines project-specific environmental air monitoring that will be performed in conjunction with the excavation, segregation, and treatment of depleted uranium chips and associated soils and wastes at Trench 1 (T-1), Individual Hazardous Substance Site 108. T-1 is located just northwest of the inner east gate of the Rocky Flats Environmental Technology Site (Site). The trench is approximately 250 feet long, 16 to 22 feet wide, and 10 feet deep. Historical documentation indicates that depleted uranium metal chips (lathe and machine turnings) packed in lathe coolant were buried in the west end of T-1 in approximately 125 drums from 1954 through 1962. The eastern two-thirds of the trench is likely to contain trash and debris such as broken pallets and empty or crushed drums.

The information that is available concerning the likely contents of T-1 is based only on historical records and interviews with former Site workers. No soil/borehole sampling has been performed due to the safety hazards associated with collecting such samples.

Under the proposed action, the drums of depleted uranium chips and incidental contaminated soils will be excavated and treated to stabilize the potentially pyrophoric uranium. Materials excavated from the trench will be sampled and segregated based on their composition and contamination levels. Contaminated materials will be transferred to a containment structure for stabilization by cementation. The stabilized wastes and contaminated soils will be packaged and shipped off Site for disposal.

The Site is subject to Title 40 of the Code of Federal Regulations (CFR), Part 61, Subpart H, which requires that emissions of radionuclides to the ambient air from the Site not exceed those amounts that would cause any member of the public to receive in any year an effective dose equivalent (EDE) of 10 millirem (mrem). To gather data related to this standard and as required by Department of Energy (DOE) Order 5400.1, the Site maintains an ongoing ambient air monitoring program that provides information about radionuclide concentrations in the air at various locations on Site and along the Site perimeter on a monthly basis.

The existing ambient air monitoring network will form the basis of an enhanced ambient air monitoring program that will be conducted during the T-1 project. During those portions of the T-1 project that have the highest potential to release radionuclides to the atmosphere (i.e., during excavation and soil or debris handling external to the containment structure), ongoing ambient air monitoring will be supplemented by more frequent sampling using existing fixed samplers in the immediate vicinity of T-1. The enhanced monitoring will collect data to track potential project

contributions to public exposure. The samples will also provide information for *post-project dose calculations and event reconstruction* if an unexpected radionuclide release occurs.

The air effluent from the containment structure will also be sampled using effluent (stack) monitors. This sampling will be performed in accordance with 40 CFR 61.93 because pre-project emission estimates indicate that treatment activities inside the structure could result in an uncontrolled EDE to the public in excess of 0.1 mrem.

2.0 PROPOSED ENHANCED AIR MONITORING PROGRAM FOR T-1 PROJECT

An enhanced, project-specific ambient and effluent air monitoring program will be implemented during soil- or debris-moving and related treatment activities at T-1. The project-specific ambient air sampling program will consist of routine monitoring based on scheduled project activities during excavation and soil/debris movement, and event sampling, which would be implemented if a radionuclide release of concern was suspected based on project information or routine sampling results. Effluent monitoring will also be performed at the containment structure stack. These monitoring programs are described below.

2.1 Routine Ambient Air Sampling

Routine sampling will be based on the existing ambient air monitoring network at the Site, with enhanced sampling in the immediate vicinity of the T-1 project. The existing Radioactive Ambient Air Monitoring Program (RAAMP) sampling network is shown in Figure 1. The RAAMP samplers are high volume, size-fractionating samplers that collect both fine and coarse fractions (separated at approximately 10 micrometers [μm] aerodynamic diameter). A two-stage cartridge consisting of an impaction plate and glass-fiber filter is installed under a slotted jet assembly in each sampler to collect airborne dust. Air flow through the cartridge is controlled using a critical orifice device that maintains a flowrate of 40 actual cubic feet per minute. The sampling media are changed weekly (enhanced) or monthly (routine) and the collecting media analyzed in a laboratory for radionuclides (1, 2, 3).

For the T-1 project, three sampling groups have been defined with different sampling and analysis frequencies:

- Project-specific Sampling: Four samplers in the immediate vicinity around T-1 will be sampled and analyzed weekly during excavation and soil/debris movement. Filter cartridges will be changed weekly and delivered to the on-Site modular laboratory where the filter that collects particles less than 10 μm diameter will be removed from the cartridge and screened for gross alpha/ beta contamination. The alpha/beta screening results will be immediately forwarded to Air Quality Management (AQM) personnel, who will analyze the results and report them to T-1 project personnel. If screening results indicate that project emissions during the previous week exceeded a level that would approximate a 1 mrem dose at the Site perimeter, if continued for a full year, an expedited isotopic

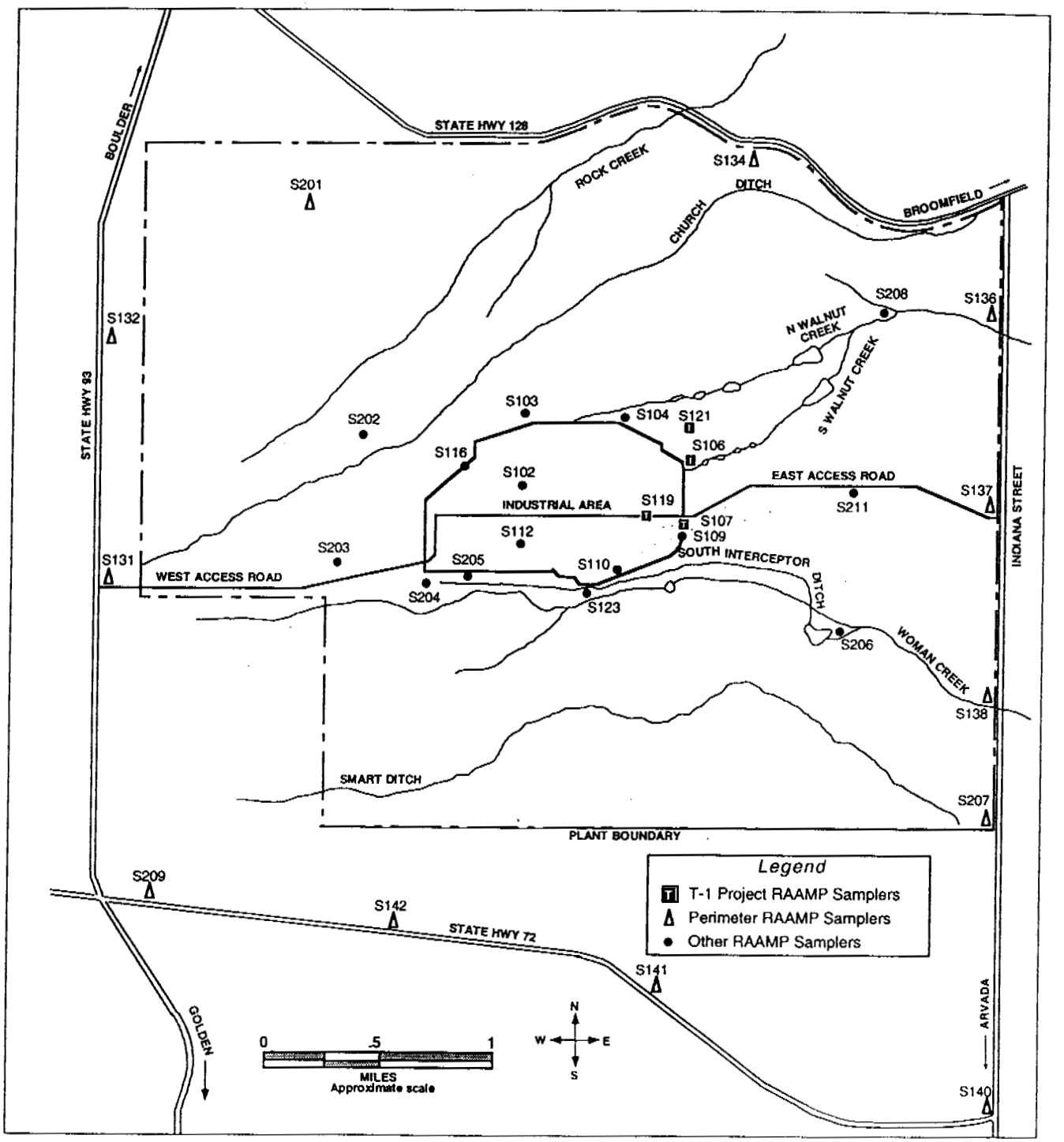


Figure 1. RAAMP Sampler Location Map

analysis will be performed on the filters from the project-specific monitors. During portions of the T-1 project when excavation and soil debris/handling are not scheduled, sample collection will revert to a monthly schedule and the filters will be archived for future analysis, except as noted below. The project-specific sampling group is listed in Table 1 and the locations are shown in Figure 1.

- Perimeter Sampling: Filters from 12 RAAMP monitors located at the Site perimeter and one on-Site sampler are collected and analyzed monthly for radioactive constituents (isotopic breakdown). This collection and analysis frequency will continue for the 12 perimeter monitors for the duration of the T-1 project (i.e., during both excavation and treatment activities).

  The on-Site monitor that is routinely sampled and analyzed monthly (S-107) is one of the four monitors described above that is located in the immediate vicinity of T-1. Consequently, filters from S-107 will be changed weekly and screened for alpha/beta contamination during excavation and soil/debris handling activities. Following screening, the S-107 filters will be composited for one-month periods and submitted for isotopic analyses. During portions of the T-1 project when excavation and soil/debris handling are not scheduled, sample collection and analysis for S-107 filters will revert to a monthly schedule.

  Isotopic information from these 13 samplers will be available to T-1 project personnel but will not be routinely reported to them. The perimeter samplers are listed in Table 1 and their locations shown in Figure 1.

- Other RAAMP Sampling: Filter cartridges from the remaining on-Site and community RAAMP samplers shown in Figure 1 will be collected monthly throughout the T-1 project and archived for future analysis, if necessary.

2.2 Effluent Sampling

Radionuclide emissions must be measured at any release point that has the potential to discharge radionuclides into the air in quantities that could cause an EDE in excess of 0.1 mrem (40 CFR 61.93(b)(4)(i)). Potential emissions from the containment structure exceed 0.1 mrem at the Site perimeter; therefore, a U.S. Environmental Protection Agency (EPA)-approved sampling system must be installed on the containment structure ventilation system outlet(s). The effluent monitoring system will collect particulates emitted from the structure on filters. Filters will be

Table 1

Proposed T-1 RAAMP Sampling Program

Sampler Location	Collection Frequency	Analysis Frequency	Analysis Type
Project Specific Sampling Network			
S-106	Weekly	Weekly	Alpha/Beta
S-107	Weekly	Weekly	Alpha/Beta and Isotopic
S-119	Weekly	Weekly	Alpha/Beta
S-121	Weekly	Weekly	Alpha/Beta
Site Perimeter Sampling Network			
S-131	Monthly	Monthly	Isotopic
S-132	Monthly	Monthly	Isotopic
S-134	Monthly	Monthly	Isotopic
S-136	Monthly	Monthly	Isotopic
S-137	Monthly	Monthly	Isotopic
S-138	Monthly	Monthly	Isotopic
S-140	Monthly	Monthly	Isotopic
S-141	Monthly	Monthly	Isotopic
S-142	Monthly	Monthly	Isotopic
S-201	Monthly	Monthly	Isotopic
S-207	Monthly	Monthly	Isotopic
S-209	Monthly	Monthly	Isotopic

Filters from all other RAAMP samplers are collected monthly and archived for future analysis, if necessary.

Notes:

RAAMP = Radioactive Ambient Air Monitoring Program
S = Sampler

changed every week, screened for alpha/beta contamination, composited into a monthly sample, and submitted for isotopic analyses. The sampling and analytical protocols that will be used for the T-1 effluent samples will be the same as those routinely employed by the Site to sample and analyze air effluent from Site buildings (2, 3, 4, 5).

2.3 Event Sampling

Additional ambient or effluent sampling and/or analysis will be performed if the routine sampling described above indicates that an unexpected release of radionuclides has occurred from the T-1 project or if project personnel believe an unanticipated release may have occurred.

The alpha/beta screening results from the four project-specific sampling sites and from the effluent monitor(s) will be compared on a weekly basis to two pre-defined action levels: Notification Level 1 and Notification Level 2. Notification Level 1 will correspond to a radionuclide emission level during the previous week that would approximate a 1 mrem dose at the Site perimeter if emissions were to continue at that level for a full year. Notification Level 2 would approximate a 5 mrem dose at the Site perimeter if emissions were to continue at that level for a full year (Notification Level 2 is similar to the level of emissions that were seen from the Trenches 3 and 4 project).

As previously described, if Notification Level 1 is reached, filters from the four project-specific samplers and/or the effluent monitor(s) will be submitted for isotopic analyses on an accelerated schedule. If Notification Level 2 is reached, AQM personnel will meet with T-1 project personnel to evaluate the suspected release and to determine what additional sample collection and analysis is warranted. Additional event-driven sampling/analyses may include changing the filter cartridges on additional RAAMP or effluent samplers and submitting the filters for alpha/beta screening and/or isotopic analyses. In addition, archived samples from other RAAMP samplers may also be screened or submitted for isotopic breakdowns. If project personnel believe releases may be ongoing, collection and analysis frequency may be increased at any of the RAAMP samplers.

3.0 DATA EXCHANGE

This section describes the information that will be provided to T-1 project personnel from the enhanced, project-specific monitoring program and lists the information that AQM will need from the T-1 project.

3.1 Information Provided to T-1 Project Personnel

The results of the alpha/beta screening analyses will be provided to T-1 project personnel weekly by AQM within approximately 72 hours following removal of the filter cartridges from the samplers. Data will be presented to project personnel in two formats:

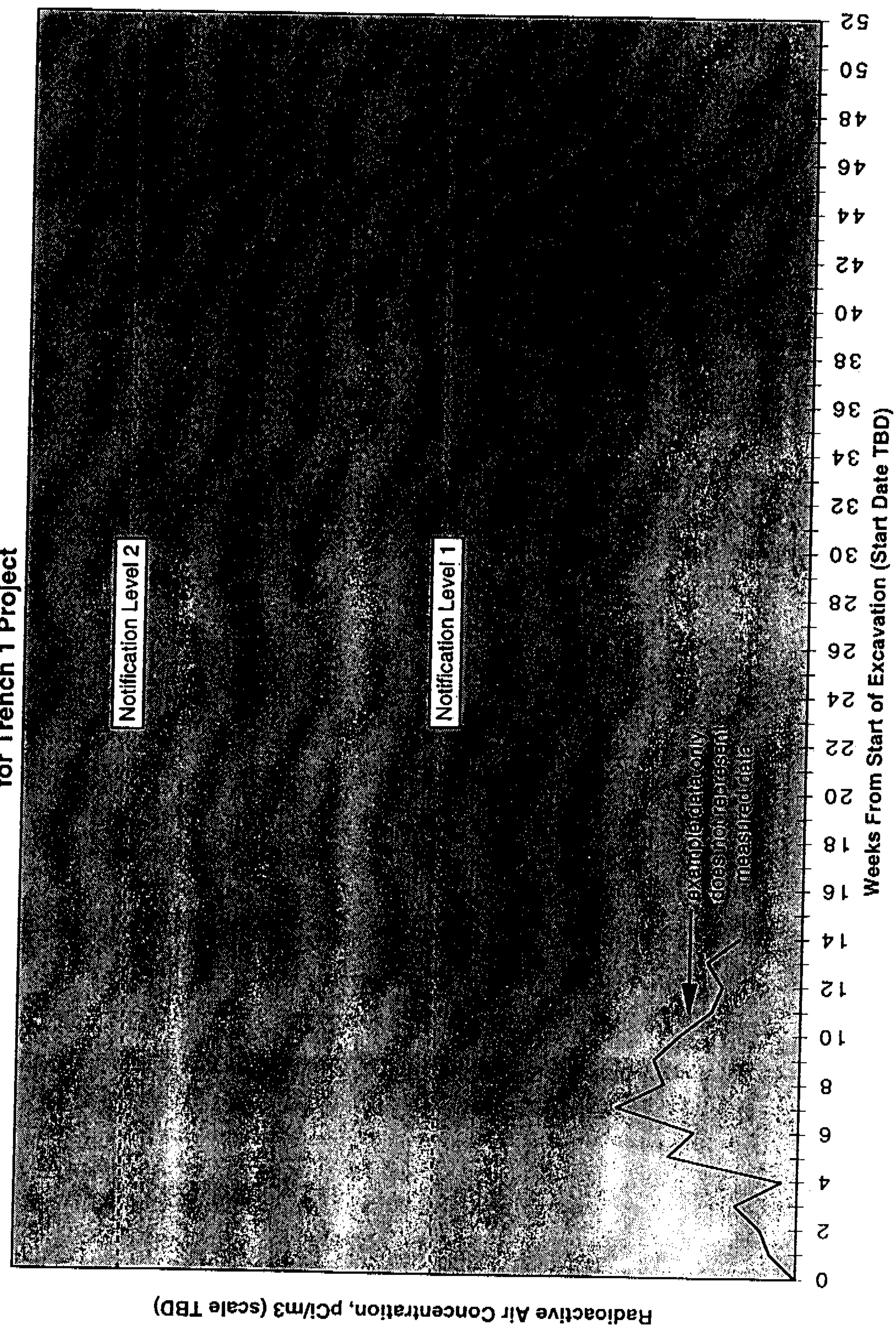
- Weekly alpha/beta screening results from the four project-specific monitors and from the effluent monitor(s) will be converted to units of activity per volume of air drawn through the filter (e.g., picoCuries per cubic meter [pCi/m^3]) based on the expected isotopic composition of materials to be disturbed, handled, and treated at T-1. The highest pCi/m^3 value from the four project-specific monitors or the effluent monitor(s) will be plotted weekly against the two notification levels identified above. An example graph is shown in Figure 2.

  If a weekly value exceeds Notification Level 1 (an activity value that would approximate a 1 mrem dose at the Site perimeter over the course of a year), project personnel will be advised that past and scheduled project activities should be reviewed to ensure that emissions will not endanger compliance with the ambient public dose standard of 40 CFR 61.92. If the weekly value exceeds Notification Level 2 (an activity value that would approximate a 5 mrem dose at the Site perimeter over the course of a year), AQM will meet with project personnel to evaluate related weekly operations that could have caused the high readings, identify any additional monitoring/analysis requirements, and adjust operations to mitigate emissions if appropriate.

- Cumulative project dose at the Site perimeter will also be plotted against a straight-line projection of expected project emissions. Weekly alpha/beta screening results will be converted to an approximation of off-Site dose based on a pre-project modeling analysis using expected, project-specific isotopic compositions. The emission/dose trend information will be provided to T-1 project personnel so that they can evaluate the impact that scheduled activities may have relative to pre-project expectations. An example cumulative project dose plot is shown in Figure 3.

Figure 2

Weekly Radionuclide Activity Levels for Trench 1 Project

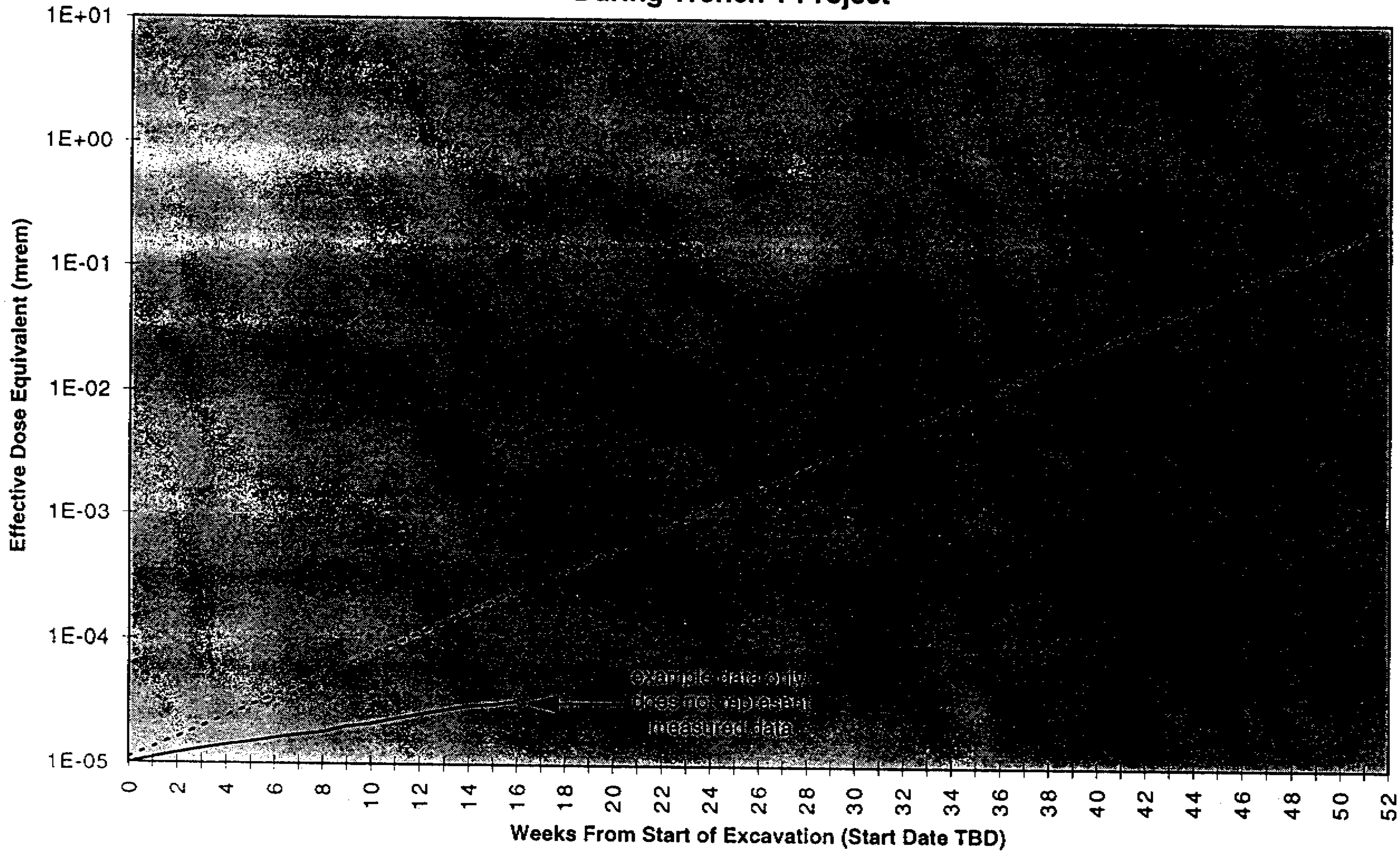


Notes:

pCi/m3 = pico (10E-12) Curies per cubic meter of air
TBD = to be determined

Figure 3

Estimated Cumulative Off-Site EDE
During Trench 1 Project



Notes:

EDE = Effective Dose Equivalent
mrem = Millirem
TBD = to be determined
- - - - - projected total EDE from T-1 project
——— actual estimated EDE from T-1 project

The results of routine isotopic analyses from ambient air samples will be available approximately six weeks following removal of filters from the samplers. The isotopic data will be available to T-1 project personnel. The isotopic data will quantify the various uranium, plutonium, and americium isotopes on the filters in units of activity per volume of air flow through the filters (pCi/m^3).

Results of any event-driven sampling will be provided to T-1 project personnel on an accelerated schedule. Alpha/beta screening results will be available within approximately 24 hours following removal of the filters from the samplers. Expedited isotopic analyses will be available in approximately two weeks.

Effluent isotopic results will be available approximately six weeks after the filters are removed from the monitoring system. Isotopic information will be provided in units of activity of specific uranium, plutonium, and americium isotopes per volume of air flow through the monitor (i.e., pCi/m^3).

3.2 Information Needed From T-1 Project

AQM will need current information on the project schedule that will dictate frequency of filter collection and analytical services. This information is also critical for planning with hourly and laboratory personnel for filter collection and analyses.

To put the results of the weekly alpha/beta screening and isotopic analyses in context, AQM will also need information about weekly project activities. A copy of the project logs or project activity summaries will be needed at the end of each week so that AQM personnel can reference that information when the results of the alpha/beta screening analyses become available. In addition, T-1 project personnel should provide AQM with a summary of data from the field instrument for the detection of low-energy radiation (FIDLER) and results of any isotopic analyses performed on excavated materials.

4.0 SUMMARY

The enhanced monitoring program for the T-1 source removal project is summarized below.

- During excavation and soil/debris handling, four ambient air (RAAMP) monitors in the immediate vicinity of T-1 will be sampled weekly and screened for alpha/beta contamination. Effluent air emissions from the containment structure will be monitored for radioactive particulates per 40 CFR 61.93 during treatment activities and screened for alpha/beta contamination. Alpha/beta screening results will be reported to T-1 project personnel weekly.

  If alpha/beta screening results for any week exceed Notification Level 1, project personnel will be advised to review past and scheduled project activities to ensure compliance with the public dose standard of 40 CFR 61.92, and the filters will be submitted for expedited isotopic analyses. If alpha/beta screening results exceed Notification Level 2, AQM will meet with T-1 project personnel to evaluate related weekly operations that could have caused the high readings, identify any additional monitoring/analysis requirements, and adjust operations to mitigate emissions if appropriate.

- Ongoing ambient air sampling at other RAAMP samplers will continue during the T-1 project. Twelve perimeter and one on-Site monitor are routinely sampled and filters analyzed for specific radioactive isotopes on a monthly basis. Additional RAAMP sampler filters are collected monthly and archived for future analyses, if needed.

- Effluent air emissions from the containment structure will be monitored and the samples routinely submitted for isotopic analyses.

- If the routine project sampling results described above or other project data indicate that an unexpected release of radionuclides may have occurred from the T-1 project, additional analyses and/or analyses of archived filters will be implemented on an accelerated schedule.

- T-1 project personnel will provide AQM with current project schedules, summaries of project activities, FIDLER data, and isotopic analyses of excavated materials.

It should be noted that the purpose of this project-specific monitoring plan is to provide ambient air and stack effluent data necessary to determine (and manage) compliance with the public dose

standard of 40 CFR 61.93, which has been determined to be protective of public health. The monitoring will **not** provide "real-time" emissions data appropriate for use in protecting worker health and safety. Also, any change in planned project activities that could change air emissions will require reevaluation of the project by AQM and possible revision of this monitoring plan.

5.0 REFERENCES

1. Kaiser-Hill Company, L.L.C. *Radioactive Ambient Air Monitoring*, Procedure No. 4-S36-ENV-AQ.13. In: Air Quality Procedures Manual No. 4-21000-AIR-001, March 31, 1995.

2. Rocky Flats Environmental Technology Site. *Statement of Work for Analytical Measurements, General Laboratory Requirements*, Module GR01-A, December 10, 1996.

3. Rocky Flats Environmental Technology Site. *Statement of Work for Analytical Measurements, Isotopic Determinations by Alpha Spectrometry*, Module RC01-A, January 22, 1997.

4. Kaiser-Hill Company, L.L.C. *Effluent Air Radioparticulate Sample Collection*, Procedure No. 4-C83-ENV-AQ.03. In: Air Quality Procedures Manual No. 4-21000-AIR-001, June 1, 1994.

5. Kaiser-Hill Company, L.L.C. *Effluent Air Radioparticulate Sampler Calibration*, Procedure No. 4-C82-ENV-AQ.04. In: Air Quality Procedures Manual No. 4-21000-AIR-001, June 1, 1994.

Appendix K

Fire and Emergency Services General Operating Guideline 3-FES-GOG-229, Pyrophoric Metals Fire Extinguishment

FIRE AND EMERGENCY SERVICES
GENERAL OPERATING GUIDELINES

Number: 3-FES-GOG-229
Revision: 0
Effective Date: 04/23/96
Expiration Date: 10/23/97
Page: 1 of: 7

Approved By: _____ / Date: 4-30-96
Fire Chief

Required Reading Files: ☒ Operations Division ☐ Support Services Division

3-FES-GOG-229
PYROPHORIC METALS FIRE EXTINGUISHMENT

1 PURPOSE:

To outline the basic properties of radioactive and non-radioactive pyrophoric metals. It also serves as a guideline for fire extinguishment. (For specific types of radioactive firefighting, see 3-FES-GOG-227, Analyzing Radioactive Fire Emergencies).

2 SCOPE

This guideline shall apply to all Fire Department personnel working under the direction of the Chief. This guideline supersedes Standing Operating Procedure 4-65100-SOP-229, Radioactive and Non-Radioactive Pyrophoric Metals (Summary & Fire Extinguishment).

3 RESPONSIBILITY:

Sector and Command Officers are responsible for assuring the correct methods of extinguishment are used to maintain firefighter safety and at the same time, extinguish the fire. Firefighters, when working independently, will utilize these guidelines as well.

4 PYROPHORIC METALS SUMMARY AND FIRE EXTINGUISHING (RADIOACTIVE):

4.1 Uranium (U)

4.1.1 *Properties:*

A naturally occurring radioactive element. May be found in isotopic forms including U-238 (the most abundant at Rocky Flats), U-235, U-234, and U-233. These isotopes primarily emit alpha radiation with some gamma and beta. Primary hazards of uranium are internal body deposition and criticality which may occur with quantities of U-235 that exceed a total of 350 grams and U-233 that exceed a total of 200 grams or combinations of uranium in smaller individual quantities.

4.1.2 *Melting Point:*

Approximately 1130 degrees Centigrade or 2066 degrees Fahrenheit.

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4 PYROPHORIC METALS SUMMARY AND FIRE EXTINGUISHING (RADIOACTIVE): (continued)

4.1.3 *Fire Extinguishing Guidelines:*

Sodium chloride based powders (i.e., MET-L-X) and dry magnesium oxide powder have been useful in combating uranium fires in industry.

4.1.4 *Special Notes:*

A. The chemical symbol of the element is given in parenthesis; the weights given here are approximates and are termed the "critical mass" for a given isotope. This is the smallest mass of fissionable material that could support a self-sustaining chain reaction.

B. MET-L-X is a very fine sodium chloride powder with additives to increase its flow rate and is manufactured by the Ansul Chemical Company of Merinette, Wisconsin. Carbon dioxide, soda acid and foam fire extinguishers are not recommended.

C. Total immersion of burning uranium (U-238, depleted or natural uranium only) in water is satisfactory only if the evolved hydrogen gas can be adequately dissipated.

4.2 Plutonium (Pu)

4.2.1 *Properties:*

An artificially produced radioactive element. Several isotopes exist including Pu-238 and Pu-239. Both emit alpha radiation and some gamma radiation. Internal deposition (particularly in the lungs) can present serious health problems. Criticality danger may exist with quantities exceeding a total mass of 200 grams or combinations of Plutonium in smaller individual quantities.

Finely divided Plutonium turnings, filings, and powders present a greater pyrophoric hazard than massive Plutonium (i.e., 500 grams) and may spontaneously ignite in air. BURNING PLUTONIUM REACTS EXPLOSIVELY WITH HALOGENATED HYDROCARBONS.

4.2.2 *Melting Point:*

Approximately 640 degrees Centigrade.

4.2.3 *Fire Extinguishing Guidelines:*

Magnesium oxide sand has been successfully utilized (first agent of choice) to extinguish fires. Sodium chloride based powders have also been used, however, it is not the first agent of choice.

4.2.4 *Special Notes:*

A. Helium, argon, or nitrogen gas applied to small fires in a gas "bonnet" apparatus has been shown to be effective.

4 PYROPHORIC METALS SUMMARY AND FIRE EXTINGUISHING (RADIOACTIVE): (continued)

B. Lead powder, iron powder, copper powder, foam, plutonium dioxide are not considered very effective.

C. Applying water directly on burning Plutonium metal is not recommended (last resort). Using water to control associated combustible fires (non-Plutonium) is recommended if criticality factors are considered low risk or non-existent.

4.3 Thorium (Th)

4.3.1 *Properties:*

A naturally occurring radioactive element. A common isotope is Thorium 232 which primarily emits alpha and gamma radiation. Thorium's pyrophoric properties are very similar to uranium with the exception that no criticality hazard exists.

4.3.2 *Melting Point:*

Approximately 1845 degrees Centigrade or 3353 degrees Fahrenheit.

4.3.3 *Fire Extinguishing Guidelines:*

Sodium chloride powders and magnesium oxide sand have been successfully used. Carbon dioxide, soda acid and foam fire extinguishers are not recommended.

4.3.4 *Special Notes:*

A. Halon 1301 gas is a trade name for bromotrifluormethane.

5 NON-RADIOACTIVE PYROPHORIC METALS:

5.1 Potassium (K)

5.1.1 *Properties:*

Usually in the form of cubic, silver-metallic crystals. Reacts violently with moisture to form potassium hydroxide and hydrogen gas. Intense heat and explosive hazard exists during combustion. Spontaneously combustible in moist air or water. Strong alkaline properties of potassium metal combustion products make it very toxic both internally and externally.

5.1.2 *Melting Point:*

Approximately 62 degrees Centigrade or 144 degrees Fahrenheit.

5 NON-RADIOACTIVE PYROPHORIC METALS: (continued)

5.1.3 *Fire Extinguishing Guidelines:*

The use of sodium chloride based powders on small pieces of burning potassium has been successful. These substances tend to "stick" to burning metal and smother the fire by sealing off oxygen.

Do not, under any circumstances, apply water or any moist substance to a fire involving potassium.

The application of sand is not recommended.

Do not use ordinary fire extinguishers (i.e. carbon dioxide, soda acid, and foam).

5.2 Sodium (Na)

5.2.1 *Properties:*

Light, soft, silver-white metal. Reacts exothermally with moisture. Exposure to body tissues or skin can cause severe thermal and chemical burns. Also reacts exothermally with the halogens, halogenated hydrocarbons and acids.

5.2.2 *Melting Point:*

Approximately 98 degrees Centigrade or 208 degrees Fahrenheit. Sodium Potassium alloys are more pyrophoric and have lower melting points than the pure constituent metals.

5.2.3 *Fire Extinguishing Guidelines:*

The use of sodium chloride based powders on small pieces of burning sodium has been successful.

Do not use water, foam, soda acid or carbon dioxide fire extinguishers.

5.3 Lithium (Li)

5.3.1 *Properties:*

Silvery light metal. Reacts violently with moisture, acids and oxidizers. Burning lithium emits toxic fumes of lithium oxide and hydroxide. Reaction with water produces hydrogen gas which is highly combustible and explosive in nature. Also reacts with nitrogen. Lithium combustion products are highly toxic.

5.3.2 *Melting Point:*

Approximately 179 degrees Centigrade or 354 degrees Fahrenheit.

5 NON-RADIOACTIVE PYROPHORIC METALS: (continued)

5.3.3 *Fire Extinguishing Guidelines:*

The use of graphite based, magnesium oxide or other dry powders recommended by processors of lithium have been used successfully on small fires. Sodium chloride based powders are generally not effective.

5.4 Magnesium (Mg)

5.4.1 *Properties:*

A dangerous fire hazard when in the form of dust or flakes. Difficult to ignite in solid form. Moisture increases the pyrophoricity. If water is applied, there will be evolution of hydrogen gas during burning which will create an explosive hazard.

5.4.2 *Melting Point:*

Approximately 651 degrees Centigrade or 1204 degrees Fahrenheit.

5.4.3 *Fire Extinguishing Guidelines:*

Smothering small pieces of burning metal with sodium chloride based powder has proven successful. Care should be taken not to spread the burning metal.

If possible, allowing the magnesium metal to burn itself out has also been shown to be effective.

Magnesium oven fires may be controlled with boron triflouride or boron trichloride gas. The gas is toxic, however, and should not be used on fires in closed areas.

Water should not be used directly on actively burning magnesium due to the explosive hazard involved. Careful application of water on "cool" fringes of the fire and on combustible material associated with the fire has been shown to be effective.

5.5 Aluminum (Al)

5.5.1 *Properties:*

May be in the form of filings, powder, paste or solid. Finely divided aluminum is more hazardous than large solid pieces. Vaporizing liquids may react violently with the burning metal and should not be used. Explosion hazards exist whenever aluminum powder or dust is allowed to accumulate.

5.5.2 *Melting Point:*

Approximately 660 degrees Centigrade or 1220 degrees Fahrenheit.

5 NON-RADIOACTIVE PYROPHORIC METALS: (continued)

5.5.3 *Fire Extinguishing Guidelines:*

Fires in aluminum pasts or slurries can usually be controlled with carbon dioxide followed by smothering with sand.

Sodium chloride based powders applied to small aluminum fires have also been used successfully.

Fires in dry aluminum filings or powder may be controlled by smothering in sand or other dry material recommended by the aluminum processor.

Precautions should be taken to avoid spreading the burning metal.

Aluminum powder, if burning by itself and not involving other combustible material, will form a crust which excludes oxygen and will eventually extinguish itself. Sand can be used to ring and isolate the fire.

5.6 Zirconium (Zr) and Hafnium (Hf)

5.6.1 *Properties:*

Both metals are typically used as solid metal, crystals or gray powder. Titanium-zirconium alloys are more pyrophoric and have a lower melting point than the pure constituent metals. Zirconium and hafnium are relatively stable under water at temperatures up to 50 degrees Centigrade. The dry powder form of these metals may combine explosively at elevated temperatures with oxygen, nitrogen, phosphorus, sulfur, halogens and other non-metals. Dry powders have a low ignition temperature and burn with an intensely hot flame which is difficult to extinguish.

5.6.2 *Melting Points:*

Approximately 1830 degrees Centigrade or 3326 degrees Fahrenheit for Zr. Hafnium is approximately 2227 degrees Centigrade or 4041 degrees Fahrenheit.

5.6.3 *Fire Extinguishing Guidelines:*

Allow fire to burn itself out if possible, smothering with dry sand or ground limestone may be effective. The use of sodium chloride-based powders on small fires may also be effective. Normally, water increases the burning rate and should not be used and carbon dioxide, soda acid and foam fire extinguishers should not be used.

5.7 Titanium (Ti)

5.7.1 *Properties:*

Normally found as a dark gray uncrystallized powder or as a white lustrous metal. Titanium will burn in atmospheres of carbon dioxide, nitrogen or air. Finely divided metal is the most hazardous and may spontaneously ignite. Highly explosive in the molten form when mixed with water.

5 NON-RADIOACTIVE PYROPHORIC METALS: (continued)

5.7.2 *Melting Point:*

Approximately 1800 degrees Centigrade or 3272 degrees Fahrenheit.

5.7.3 *Fire Extinguishing Guidelines:*

Allowing the fire to burn itself out, if possible, may be the best extinguishing method. The use of sodium chloride based powders on small fires may also be effective. Argon and helium bases may be of benefit if applied in airtight enclosures.